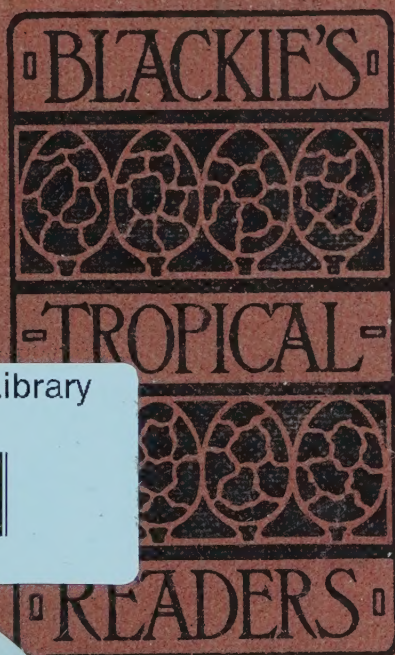


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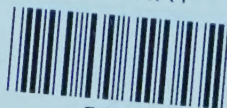
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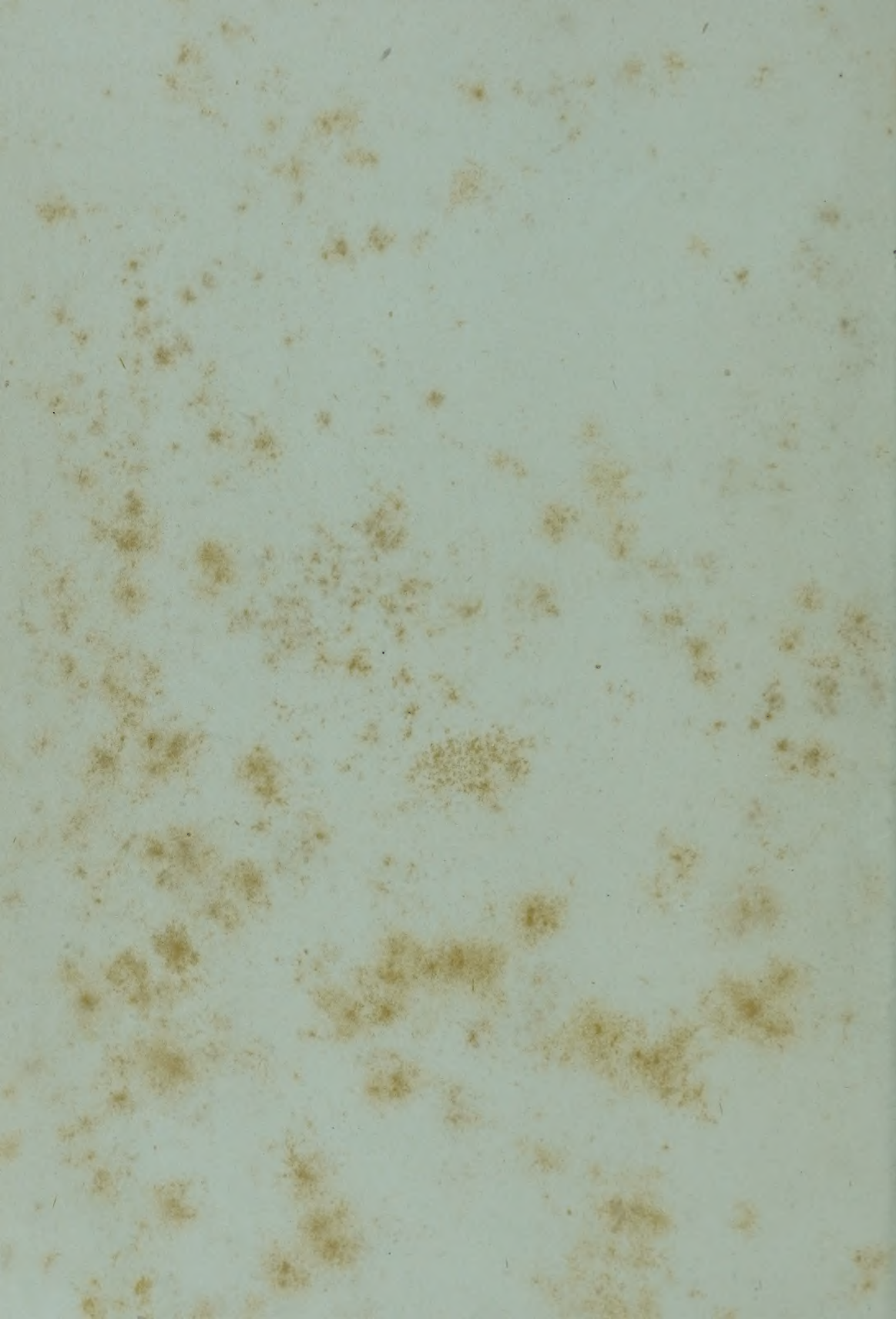
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SENIOR TROPICAL READER

I.—INTRODUCTORY

Many of us live all our lives in the tropics, some of us even in one particular part of them, maybe in the East, or in Africa, or in the West Indies. Those among us who have never visited cold countries have at any rate heard about them, and have seen pictures of big cities and of countryside scenes where in winter the trees are leafless and the ground is often covered with snow; though in summer everything is green—greener and fresher-looking than in most hot countries.

People in tropical lands who live near the sea have seen the big ships that bring the flour from which bread is made, and bring also most of the machinery and manufactured articles in daily use in hot countries. They have seen these ships set out again laden with sugar, cacao, coffee, rubber, or other tropical produce to be carried by them to the temperate countries from which the ships have come. Besides machinery and manufactured goods, steamers bring us books; for, though newspapers and journals are fairly plentiful with us, it is from Great Britain, Canada, and the United States of America,

countries of the north temperate zone, that most of our histories, our books on science and philosophy, our poetry, and our stories come.

The dwellers in the cold temperate countries of the northern hemisphere have all heard of the warm regions where the cacao and coffee and tea they drink are produced, and have seen pictures of dense tropical forests and of deserts where it is so hot and dry that only a few spiny-like plants can manage to exist. They also, perhaps, have seen views of tropical islands, with the graceful coco-nut palm fringing the shore. Above all, they have seen, confined in cages, something from the tropics which many boys born in that region have never set eyes on—wild animals, like lions and tigers. Nowadays in the tropics it is only in parts remote from towns and villages that these animals are met with.

Those who have never even visited them know at any rate that these regions are principally peopled by dark races. In the settled parts (which generally border the sea) the native races are becoming more and more educated, and more and more skilful in their work. This is largely due to the influence of the northern temperate countries, which in most parts of the tropics have established what we know as colonies or protectorates. In these settled districts towns have grown up; and it would surprise those who have never visited the tropics to see electric light there, and telephones, and street cars, and motor-cars, and railways. In the surrounding districts are estates growing various crops, according to the suitability of soil and climate. Most of these estates are well laid out, and are cultivated in as orderly a way as any English farm.

So the idea of dense forests swarming with insect life

and wild animals, or the other extreme of desert regions, is not a complete or true picture of the tropics. In fact, the scenery in many parts of the tropics does not greatly differ from that of northern countries. The chief difference is the warmth all the year round, which enables plants to grow continuously. Yet this growth does not occur everywhere, because in the tropics you have dry seasons, which in their effect on plant life correspond to the cold seasons of the north; that is, they produce a resting or sleeping period, during which the plant does not grow. And you will remember that some of the high table-lands or savannas in the tropics have quite a cool climate—so cool, indeed, that fires are necessary at night. You will easily understand the reason for this when you remember that for every 300 feet you rise above sea-level the annual average temperature is lowered by about one degree.

While only a very small proportion of the tropics has as yet been fully developed, each year sees greater and greater advancement; health conditions are improved, so that even white people by living carefully, and taking all necessary precautions, can keep perfectly well in these tropical lands; more roads and railways are being constructed; towns grow bigger; more and more forest land is brought under cultivation; more and more minerals are mined.

Already the raw materials produced in the tropics form the basis of most of the great manufacturing industries, and the source of a considerable part of the food-supply of northern temperate countries. So the northerner must no longer regard the tropics as a land of jungle or of desert, nor as the home of lazy and unambitious people. It is a progressive region of the world, where science is

rapidly overcoming natural obstacles, and where vast amounts of money are being—indeed have already been—invested in highly organized and extensive industries.

The lessons which follow will show how this intimate relationship between the tropics and temperate countries came to be established, and describe the different products which the tropics yield in such remarkable variety and abundance. But all this progress, it must be remembered, has only been achieved by means of hard work and self-sacrifice, and by the maintenance of law and order.

II.—DISCOVERY AND EXPLORATION

The spices and silks from India and the far East had been in great demand in Europe from the time of the Roman Empire. Even in the first century of the Christian era it is estimated that the gold and silver sent to India to pay for spices, precious stones, muslin, and other cotton goods imported into Italy came to more than half a million annually.

Trade with the East by way of the Black Sea, of Syria, and of Egypt was taken up by the great Italian cities Venice and Genoa, and during the times of the Crusades the efforts of these cities to secure a monopoly in the trade led to many fierce fights between them by land and by sea. The desire for the spices of the East was still strong, but it could not easily be satisfied, as the caravan trade both by the northern and southern routes had been made impossible by the Turkish conquerors.

New beliefs about the shape of the world were current at this time, and were held, naturally, more particularly

by map-makers. Among the best known of these was Christopher Columbus, a Genoese sailor, who, on his faith in the roundness of the earth, tried to persuade the King of Portugal to entrust him with an expedition to sail west. By so sailing he held that he must, the earth being round, reach the eastern shores of Asia, must reach either India or China or Japan.

Failing to persuade the King of Portugal to provide the cost of the expedition, he applied to Ferdinand and Isabella, the rulers of Spain, who caused to be fitted out for him three ships having crews amounting in all, some say, to ninety, others to a hundred and twenty men. With these, on the 3rd of August, 1492, Columbus set sail for the Canary Islands. Leaving there on the 6th of September, he continued to sail westward, notwithstanding the terror of his frightened crews, who threatened mutiny, until he sighted land on the 11th of October.

Remember that Columbus knew nothing of the existence of another continent in the Western Hemisphere, that he had very wrong ideas as to the size of the earth, and you will understand why he thought the island he had reached was an island off the coast of India. We learn that on his second voyage all on board the fleet signed a paper declaring their belief that Cuba was a continent, and a part of India. Thus you see why the name West Indies was given later to the islands to distinguish them from the East Indies, which lie to the south-east of Asia.

On his return to Spain Columbus was welcomed with delight. When he entered Barcelona the inhabitants came out in procession to meet him, and Ferdinand and Isabella, the King and Queen, ordered him to be seated in their presence. The discovery of the New World by

Columbus opened what we may call the "age of discovery", an age which seems now nearly at an end. With the exploration of Africa and Central Asia, and the discovery of the North and South Poles, there seem to be no more "worlds to conquer" in this way.

Portugal shared with Spain the distinction of taking the lead in these explorations which made known to Europeans new lands. Vasco da Gama made his way round Africa to India, and Cabral discovered Brazil. Spain and Portugal had so far taken the lead that Pope Alexander VI issued a bull giving to Spain all the countries lying within 180 degrees west of a line drawn from pole to pole, and passing 100 leagues west of the Azores; and to Portugal all the countries discovered for 180 degrees east of that line, dividing thus between Spain and Portugal all the undiscovered countries of the world.

Spain claimed the New World, including the West Indies; claimed the sole right to trade therewith, and the right therefore to prevent other countries from doing so. This claim was in the 16th century challenged by the English, and it was in the war between England and Spain caused by this that the *Revenge*, the ship of Sir Richard Grenville, fought her great fight.

In the 15th century Portugal and Spain took the lead in exploration and discovery, but they were closely followed by England; indeed, John Cabot, a Venetian employed by Henry VII, was probably the first of modern Europeans to reach the mainland of America.

As the Portuguese and Spaniards sought to reach the shores of India by sailing south-west, so the English sought to reach them by sailing north-west, and later by sailing north-east. Hundreds of years were to pass before the correctness of their ideas was proved.

Though English exploration was interrupted during the reigns of Henry VIII, Edward VI, and Mary, and was only resumed in the latter half of the reign of Elizabeth, the names of English explorers—Frobisher, Davis, Hudson, Baffin, &c.—are inseparably associated with the map of North America. Even better known to the world generally are the names of those princes of adventure and romance, Drake and Hawkins, Gilbert, Grenville and Raleigh. During the 17th century the colonization of the North American continent, the extension of the trade with India and the East, and the struggle for freedom from kingly and other tyrannies absorbed much of the energies of England; and it was not till the 18th century that Britain resumed those explorations in Africa, in the southern seas, and round the North and South Pole which have made her so famous.

Up to the middle of the 19th century, notwithstanding the labours of Bruce and Park, Denham and Clapperton, scarcely anything was known of the interior of Africa. Then the explorations of Baker, Burton, Speke, and Grant, and above all of Livingstone and Stanley, opened up the dark continent for the world. During the 19th century Australia and New Zealand were added to the Empire, and most of the former, and all the latter, explored.

Franklin and Ross, and other daring British navigators, with the help of bold Norwegians and Swedes, prepared the way in the 19th century for the discovery in the 20th of the North Pole by the American Commander Peary, and of the South Pole by the Swede Amundsen and the Englishman Captain Scott. In this work Sir E. H. Shackleton played a distinguished part.

III.—CARAVANS

Nothing would have surprised the people of olden times so much as the ease and rapidity with which we now transfer goods from one part of a country or from one part of the world to another. Even now, to many of the less civilized peoples of the world the way we do so seems unnatural, the result of magic, and to them the civilized man is a magician.

In early times there were no roads, no wheeled carriages, and goods were borne on the backs of men or animals. As the goods so carried were usually of great value, and therefore very desirable, they were a strong temptation to the people of the part of the world through which they were carried, who often found the easiest way of getting the desired articles was to rob, or even to murder, those to whom they belonged.

On the other hand, the profits to be got from successful trading were so great that men were tempted to run risks. Even as late as the times of Queen Elizabeth and King James I, those engaged in trade with far-away lands were spoken of as "merchant adventurers". Of course, men of that sort took every care to make the risks of their traffic as small as possible; and one of the surest ways of doing so was for numbers of those who were going to the same place with goods to combine together and go at the same time. Then they could afford not only mutual help, but, if the journey were specially risky, could hire an armed escort.

Until comparatively recent times this seems to have been the only way of carrying on business generally understood. In many parts of the world it is still the



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Halt of a Caravan at Peshawar, India

chief, and was till not very long ago the only, way. These combinations of men for mutual help and protection in the transport of their goods are called caravans, and caravans are still the chief ways of trading all over south-eastern Asia and over a large part of Africa. In tropical Africa and America, and in some of the sub-tropical parts of Western Asia, where formerly caravans were the usual means of carrying on trade, railways are now playing a part of ever-increasing importance.

The men who took part in these trading adventures were often men of the most daring and original kind. As a rule, the routes followed by the caravans were the same. This was due to the fact that the traders invariably sought the easiest and safest route. In settled lands the rulers held the chiefs of the parts through which the caravans passed responsible for the safety of the traders and of their goods. Such was the case in India about two thousand years ago.

Sometimes, when the routes were fixed, men found it profitable to bargain with the traders, and to promise for a consideration that they and their goods should pass safely along the route. Between the men who guarded the routes and those who lived on both sides of them, and who found it in their interest to rob the caravans, there was a constant warfare, and many of the mythical tales of heroes and demigods are said to have had their origin in these struggles. Not very long ago a French writer showed how probable it was that Odin, the god worshipped by the nations of northern Europe, was only one of those route-protectors.

Goods were as a rule carried on the backs of animals. Camels and mules were the favourite pack-animals, while the owners of the merchandise usually rode along-

side on horses or donkeys. The pack-animals were fastened together in strings; but no doubt you have seen pictures of an Eastern caravan. The object of thus fastening the animals together was to make it easy, when a halt was made, to see that all were there, and to prevent the pack-animals wandering from the road. In the settled parts, where they were needed, wells were dug along the routes, and at the wells the caravans generally halted. Through the desert parts the routes mostly led from one oasis to another, and at these fertile spots the caravans stopped to recover from the fatigue of their desert journey.

At a fixed time every year the caravan for a particular place set out. Sometimes there was only one caravan to a particular place in the year, while to other places there might be two, three, or more such trading excursions.

It seems hardly believable that, save for the business done by river and sea, this was for thousands of years the only way of carrying on trade between one country and another. We appear now to be nearing the end of it. Roads are being made in all parts of the world. Even in Africa there are now thousands of miles of railway, and these are being added to daily, and in what may be called specially the "land of the caravan"—Turkey in Asia and Persia—railways are taking its place.

IV.—MARCO POLO

The most famous European traveller in the Middle Ages was Marco Polo, a Venetian. The story of his travels was written and published by himself, and gives a vivid picture of the countries through which he passed, and the peoples among whom he spent many years of his life.

In the 13th century the great Mongol ruler, Kublai Khan, had so extended his dominion, that the whole territory from the Arctic Ocean to Siam, from the Pacific to the banks of the Dnieper was under his rule; and he made Cambaluc, now known as Peking, his capital. Asia was thus, being largely under the control of a single ruler, thrown open to western travel and trade as it had never been before.

Marco's father and uncle had reached Cambaluc, the capital of Cathay, as China was then called, about the year 1260. Kublai Khan received them most kindly. He had just succeeded to the throne, and he listened eagerly to what they had to tell of western life. When they were returning, he gave them letters to the Pope asking for educated men to instruct his subjects in Christianity and science. He sent with Marco's father and uncle a messenger who was to act as his ambassador to the Pope; but, as this officer took ill on the way, he had to be left behind. Marco's father and uncle reached Venice in 1269. The Pope, Gregory X, sent back with the brothers Polo two Dominican friars; but these lost heart and turned back before the expedition reached Persia. Young Marco, a lad of seventeen, however, accompanied his father and uncle, and it is to his notebook that we owe the only real description of the countries of

central and eastern Asia that we have, before the discovery of the sea-route to India and the East.

Marco and his father and his uncle started from Acre in 1271, and made their way to the Persian Gulf; then striking northward they passed through Persia, and ascending the river Oxus, and crossing the Pamir plateau, descended into Kashgar, passing through Yarkand to Khotan. Thence they crossed the great desert of Gobi into China. They found the Great Khan at his southern capital, Chungtu, now Peking, which they reached in the spring of 1275.

Kublai received them with great cordiality, and took such a liking to the young Marco that he soon employed him on public service in missions to many parts of his dominions. Finding that the Khan had great delight in hearing of strange countries, Marco took care to store in his memory or his notebook all the facts about the places he visited which he thought likely to interest Kublai, and these he afterwards gave to the world.

Meanwhile the elder Polos were gathering wealth to take back home to Venice; but for a long time the Khan refused to allow them to leave. At last, however, he consented, although reluctantly. He loaded the party with presents, and sent by them messages of friendship to the sovereigns of Europe.

They set out on their return voyage from a Chinese port in the beginning of 1292. The voyage was unfortunate. They were detained a long time on the coast of Sumatra, and again in the south of India, and did not reach Persia until more than two years after their departure from Peking. They had left China in fourteen large and well-equipped ships, taking with them a granddaughter of Kublai Khan who was betrothed to the ruler

of Persia, and whom after their adventurous voyage they delivered in safety. After some stay in Persia they set out for Venice, which they reached some time in 1295.

Marco Polo was the first European to give an account of a journey across the whole of Asia; the first to describe the wonderful Court of Kublai Khan at Peking; the first to tell of the wealth and vastness of China; the first to describe Tibet; to speak of Burma and Siam, of Japan, of Java, and the other islands of the Great Archipelago. He was the first, too, to tell of Ceylon and India as countries seen and travelled in by himself. He tells of Madagascar, and gives the only distinct mediæval account of the ancient Christian empire of Abyssinia. He, too, first gives a description of the frozen Siberian plains, with their dog-sledges and domesticated reindeer.

A man who had travelled so much, and given such a truthful record of his travels to the world in a book, is justifiably ranked among the foremost of the world's travellers. There is one thing that strikes us very forcibly in this narrative, and that is the length of time it took to get from one place to another, either by overland routes, or by the method of coasting voyages by sea. It was this which prevented, in spite of Kublai Khan's eagerness to establish them, any continued communications between his great empire and the West.

V.—SHIPS

In addition to the overland trade by means of caravans, there was also in ancient times a very considerable amount of trade done, especially among the nations

which lived around the Mediterranean, by means of ships coasting along the shore. This traffic led to much more real intercourse among neighbouring nations than overland travel did. So we find that those nations around the Mediterranean were the first to get some idea of a community of interests, and to pass from one country to another with some degree of freedom; they were thus prepared, by previous intercourse and mutual acquaintance, to be welded together into one empire by the Romans.

Now, even in the Mediterranean, though all round it lay lands that were well known, long before, in the 14th century, the use of the mariner's compass became general in Europe, sailors were naturally very timid about putting to sea out of sight of land. A voyage in ancient days from one end of the Mediterranean to the other, from Tyre to Cadiz for instance, was accomplished by keeping as close to the northern shores as possible, so that a ship was hardly ever for many hours at a time at any great distance from the land.

The Phœnicians and their Carthaginian colonists seem to have been the earliest and boldest of those coast-wise navigators. Both these nations, as the Greeks also did, founded colonies on various spots round the Mediterranean seaboard. These colonies, which were chiefly planted for the sake of trade, helped very much to the better acquaintance of different races with each other.

The Phœnicians were not only bold sailors, but very keen traders. In search of articles they needed, especially metals, such as tin and gold, they ventured in very early times through the Straits of Gibraltar, and, sailing along the western coasts of Spain and France,

went as far north as Britain, where they carried on a regular trade for tin with the people. Southwards, too, they sailed down the west coast of Africa, certainly as far as the Equator, though they do not seem to have set up any permanent trade with those regions. At the same time they set up a trade for gold, and the products of the East, by sailing down the Red Sea and along the shores of the Indian Ocean. We are all familiar with the trade which King Solomon, in alliance with the Phœnician sovereign, Hiram of Tyre, carried on with foreign countries, with the port Tarshish, and with Ophir, which, though its site cannot now be fixed, may have been a port on the west coast of India.

Ships, even the unseaworthy craft of early times, were so superior as carriers of merchandise to any animals employed for the purpose in caravans, that wherever the coasting trade was possible it continued to increase. Ships, in the first place, could carry so much more freight than numbers of camels or baggage mules, and, in the second place, men on board ship are not nearly so much wearied by a journey as are travellers by land. For these reasons, regular communication by ship between distant countries grew, but still only so far as it could be carried on along the coasts. Thus the sea began really to be the highway of the nations, even though it was only a narrow way along the shore, until in the 15th century the brave Portuguese, Spanish, and Italian sailors showed the way across the broad road of the world's great oceans.

VI.—VASCO DA GAMA

Perhaps the strongest influence which led to the establishing of regular communication between the countries of Europe and the lands which lie within, or on the borders of the tropics, came from the desire of Europeans for spices and strong perfumes. The Romans and Greeks, the Phœnicians and Persians, in ancient times, either by caravans or in ships, sought to obtain—besides gold and silver and precious stones—pepper and cinnamon, and sweet-smelling woods and gums, from India and Ceylon. Trying to reach the lands that produced these desired articles, the Portuguese pushed their discoveries down the western side of Africa, and, at last, in 1498, boldly steered across the Indian Ocean to establish a great trade with the Malabar coast of India.

At the beginning of the 15th century the fact, which had been known to the ancients, that the world was a globe, had become recognized again by the educated men of the time. There lived then in Portugal a most enlightened prince, Henry the Navigator, the grandson of the English John of Gaunt. Under his patronage, Portuguese sailors discovered Madeira, the Azores, the Canary Islands, and the Cape Verde group, and fairly well explored and mapped out the West African coast as far south as the Gambia.

After Prince Henry's death, the kings of Portugal, one after another, encouraged discovery, and fitted out expeditions, with the aim of finding a sea-route to India. At last, in 1486, Bartolomeo Diaz struck across the Gulf of Guinea, and sailed right down the south-west coast of Africa. A series of severe storms drove his ship

far to the east, and, as he was making his way back, he found out that he had been driven round the southern end of the continent, round the point he named, in memory of the tempests he had met with in its neighbourhood, the Cape of Storms. When, on his return to Portugal, he gave an account of his voyage and discovery, the king changed that name to the one it is still known by, because of the "good hope" its discovery afforded that the way to India had now at last been found. This hope was before long to be turned into a certainty.

In 1497, moved, no doubt, by the discoveries of Columbus in the West, about which Europe was then excited, the King of Portugal fitted out three ships, and sent them under the command of Vasco da Gama, with orders to double the Cape of Good Hope, and, if possible, to reach India.

Gama sailed in July, 1497, and, having passed round the Cape, sailed up the east coast of Africa, as far as to Mombasa. Then, having met some Arab traders who knew, and did business with, the Malabar coast, he took one of them on board his ship as a pilot, and sailed right across the Indian Ocean. In the month of May, 1498, ten months after leaving Lisbon, he anchored off Calicut. The ancient problem was solved; the way by sea to India was found at last.

Gama was kindly received at first by the ruler of Calicut. Arab traders, however, who saw in the arrival of the Portuguese a menace to their monopoly of the eastern trade, soon managed to poison the mind of the ruler against the western strangers, so that they barely escaped imprisonment or death in Calicut. Gama then proceeded to Cochin, and made favourable trading terms

with the local chieftains. After this he returned to Portugal with glowing accounts of the wealth of the countries he had visited, and of the immense profits to be obtained by trade with them.

Next year another expedition was sent from Portugal, under the command of Alvarez Cabral. He was driven so far west that he landed on the coast of South America, and formally claimed for the Portuguese king the huge territory of Brazil. Thence he sailed across the South Atlantic and the Indian Oceans, and after a stormy voyage, in which four ships of the expedition were lost, including one commanded by the discoverer Diaz, reached Cochin, where he established a trading station.

A strong expedition was sent out again under Gama in 1502. He landed at Calicut, and annexed the country on behalf of the King of Portugal, leaving a strong garrison behind him. In 1524 he again returned as Viceroy, but died soon after.

These Portuguese discoveries made an utter change in European trade with the East. From the overthrow of the Greek Empire by the Turks what trade there was with the East had come up the Red Sea, and by way of Egypt to Venice, whose merchants distributed the spices, perfumes, and silks of the East through Europe. Now the trade went more and more into the hands of the Portuguese, and later on into the hands of the Dutch and of the English, who in their wars with Spain gradually secured the Portuguese trade for themselves.

VII.—COLUMBUS

The wish to reach the countries of Asia by a western route, instead of by a journey through the Mediterranean and the Levant, with the certainty of being troubled by the Turks and the Venetians, prompted the Genoese sailor, whom we know under the Latin form of his name as Columbus, to think of the possibility of reaching those lands by travelling westward to the other side of the world; and made him finally set sail from Palos with three small vessels across the Atlantic, to see if this were possible.

Born about the year 1446, Columbus became a sailor at the age of fifteen, and appears to have made voyages during the next twenty years, not only in the Mediterranean, but to England, and even to Iceland, and also as far south as the Guinea coast, which was then being explored by the Portuguese. All this time he was preparing himself for what was to be the great work of his life. He read much, especially books of travel, such as those of Marco Polo. He practised making charts, and studied nautical astronomy, thus becoming a thoroughly efficient navigator.

In 1476, after a sea-fight, he was wrecked on the coast of Portugal, and arrived at Lisbon, where he took to drawing maps and charts for a livelihood. About this time he came to the conclusion that much of the world was still undiscovered, and he conceived the design of reaching Asia by sailing west. He believed the world to be a sphere, though he under-estimated its size, while at the same time he over-estimated the size of the Asiatic continent. Reports and traditions current among sailors strengthened his argument. His own brother-in-law,

Pedro Correa, for instance, had picked up on the beach at Madeira, after a westerly gale, strangely carved bits of wood, and had heard of corpses "unlike Christians" having been washed ashore in the Azores. On his visit to Iceland, too, he may have heard the old story of Leif the Viking's discovery of Vinland far to the west. He resolved to find some means of sailing to the west beyond any limit which man had yet dared to pass.

In furtherance of this resolve, he first placed his arguments before his native state, Genoa, which rejected his proposals. He next turned to the King of Portugal, who listened attentively to him, and then, without informing Columbus, secretly sent out a small ship with orders to proceed across the Atlantic. The crew of this ship lost heart soon after passing the Azores, and returned. Indignant at this treachery, Columbus left Lisbon for Spain, while he sent his brother Bartholomew to England, to Henry VII, with a letter telling of his ideas, in the hope of getting help from that monarch to carry them out.

Meanwhile he himself was able to lay his plans before the Spanish sovereigns, Ferdinand and Isabella. After many weary delays the queen was at last led to help him to put his beliefs to the test. She provided him with three small ships, of which only one was decked. Great difficulty was then found in inducing men to venture on this unheard-of voyage. At last, however, on 3rd August, 1492, Columbus sailed from Palos south-west into the Atlantic, in command of 120 men on board these three small craft.

His aim was to reach the wonderful land of Cipango, as Japan was called by the old travellers; and he hoped to convert to Christianity the Great Khan, to whom he

took a letter of introduction from the sovereigns of Spain.

After leaving Spain, Columbus touched at Teneriffe for some necessary repairs to one of his ships; and then he boldly steered out into the unknown ocean. The fears of his men over and over again almost led to a mutiny, but after five weeks of fine weather land was sighted on 12th October, 1492. This proved to be an island, called by the natives Guanahani. Columbus named it San Salvador, and took possession of it for the King and Queen of Spain. It is in the Bahamas, and is known as Watling Island. Having understood from the natives that there were larger and richer lands to the south, Columbus soon sailed in that direction, and discovered the great islands of Cuba and Hispaniola. Off the coast of this latter island the largest of his ships got aground, and was so badly damaged that it was found necessary to abandon her. Out of the wreck a fort was constructed, and forty-three men of the expedition were left behind in it; and so was set up the first European colony in tropical America. Columbus set sail homewards, with his two other ships, on 16th January, 1493; and on 13th March he again dropped anchor in the harbour of Palos.

His reception was almost royal. The king and queen made him sit before them while he told the story of his voyage, and showed to them some of the wonders of the new-found lands, golden ornaments, cotton robes, strange plants and birds, and the nine natives he had brought back. The highest privileges were conferred on him in connection with the government of the places he had discovered, and as to the profits to be got from them.

In September of the same year he again sailed west-



Gathering Cocoa Pods, West Indies

ward, now in command of a fleet consisting of three great galleons and fourteen smaller vessels, having on board about 1500 men, along with domestic animals and other materials for permanent settlement.

The first land sighted on this voyage was the island which Columbus named Dominica, in honour of Sunday, the day of the week on which he discovered it. Sailing northward to the settlement he had left on Hispaniola, Columbus passed along the Leeward Islands of the West Indies, landing on some of them, and giving names to many, which they still bear.

On arriving at Hispaniola he found the fort burnt and the settlers killed. There, however, he landed his colonists, and began to lay out the plans of the city, which is now known as San Domingo.

The rest of the great admiral's life was full of care and disappointment. The colonists were ungrateful and lawless. The authorities in Spain were greedy and jealous. He took two more voyages back and forth, and in the intervals continued his explorations, discovering most of the West Indian islands, and certainly sighting the coast of the mainland.

In 1506 he died in Spain, worn out with anxiety and sickness. He had suffered the greatest indignities at the hands of King Ferdinand, to whose dominions he had added a new world.

Columbus by his discoveries laid the foundations of a mighty transatlantic empire for Spain. But the Spaniards jealously tried to shut out all other nations from any share in the products of the new world, while at the same time they cruelly ill-treated the natives of their new dominions, and even oppressed their own colonists. At the end of the 18th century and the beginning of the

19th, one after another of her American possessions revolted successfully from Spain, and proclaimed their independence. At last, in 1898, as the result of a war with the United States of America, Spain was deprived of Cuba and Porto Rico, her last colonies in the West Indies, and of the Philippines, her last colony in the East Indies.

VIII.—OTHER EARLY SPANISH EXPLORERS

The work of exploration of the New World which Columbus had begun was rapidly carried on.

On his third voyage Columbus himself discovered the north-eastern coast of Venezuela, and on his fourth voyage he explored the east coast of Panama, Nicaragua, and Honduras. Amerigo Vespucci, after whom, because of his maps and descriptions, the whole continent came to be named, was on board a ship, which in 1499 appears to have surveyed the coasts of the mainland to the south of the Caribbean Sea; to have made the entire circuit of the Gulf of Mexico; and to have passed for some distance up the east coast of North America.

The first landing to take possession of the mainland of Central America seems to have been made by Bartholomew, the brother of Christopher Columbus. He landed on the coast of Honduras in 1502, and took possession of the country in the name of the King and Queen of Spain.

Vasco Nuñez Balboa crossed the Isthmus of Panama in 1513, and saw the Pacific stretching away to the south and west. He waded out into the water, and solemnly claimed the great "Southern Ocean" for the empire of Spain.

In that same year Ponce de Leon named and took possession of Florida; during the remainder of the first quarter of the 16th century Yucatan and Guatemala were added to the dominions of the Spanish monarch, while in 1519 Hernando Cortes began his conquest of the old and powerful kingdom of Mexico.

Meanwhile the coasts of South America were also being explored. Vincente Yañez Pinzon, a Spanish sea-captain, the brother of Martin Alonso Pinzon, who accompanied Columbus on his first voyage, had sailed as far south as the mouths of the Amazon; Amerigo Vespucci, according to his own rather doubtful accounts, had explored the coast between Rio de Janeiro and Monte Video; De Solis had gone up the Rio de la Plata; and Magellan had sailed along the coast of Patagonia, and had discovered the passage from the Atlantic to the Pacific through the strait which still bears his name. His ship sailed round the world, although he himself died on the voyage. A few years after Francisco Pizarro crossed the Isthmus of Panama, and led an expedition against the highly civilized kingdom of the Peruvian Incas, which resulted in the complete overthrow of that power, and the gaining by Spain of what was long her richest province.

During the second quarter of the 16th century the Spaniards carried on the exploration of the western coast of America, discovering the peninsula of California, and going up the coast as far as Oregon.

Then the pioneering work of the Spaniards came to an end, as far as coast discovery was concerned. They were too busy with the conquest of the rich countries in the interior of tropical America, to trouble themselves about the colder, and apparently less valuable countries

lying in the north and south temperate zones. The English, French, and Dutch were the nations who, after the middle of the 16th century, carried on the exploration of North America and temperate South America; while the Spaniards bent their powers to tracing the course of the great rivers of tropical South America, the Orinoco, the Amazon, and the tributaries of the Paraná.

IX.—THE ORIGINAL INHABITANTS OF THE WESTERN WORLD

Columbus, when he landed on Guanahani, thought that he had reached the eastern lands of Asia, and he probably died without discovering his mistake. The appearance and condition of life, however, of the nations of tropical America were very different from those of the inhabitants of Asia, as described by travellers such as Marco Polo, and yet the name Indians, as applied to them by Columbus, has remained in use to the present time.

The early Spanish and Portuguese explorers found the islands and lands of tropical America peopled by brown or yellow-skinned natives, with long, straight black hair, and without beards. The various tribes differed very much in the degree of civilization at which they had arrived. The tribes of the Amazon valley were completely savage, while some nations of central and southern America, notably those inhabiting the table-lands of Mexico and Peru, possessed an old, and, in many respects, a highly-developed system of life.

The people of the Bahamas and of the Greater Antilles, with whom Columbus first became acquainted, belonged

mostly to the gentle Arawak race, which had attained in the larger islands a considerable degree of civilization. Although the people went almost naked in the daytime, they had coverings for night use made of woven cotton; they cultivated the ground, their principal crop being manioc, or cassava. Though their implements were of stone, they had developed much skill in carving, not only in wood, but even in stone. They also used golden ornaments hammered or twisted with considerable taste.

The Lesser Antilles, however, from the Virgin Islands in the north to Trinidad in the south, were mainly inhabited by tribes of Caribs. They were a fierce and warlike people, who had driven the peaceful Arawaks from all the southern islands, and continued to make attacks upon them in their northern homes. Both Caribs and Arawaks came originally from the northeastern part of South America, where tribes of both races are still to be found.

The Caribs were a well-made active race, who soon showed a bitter hatred against the Spaniards. In fact, it was probably the difficulty of subduing the warlike Carib inhabitants which kept the Spaniards from effectually settling the Lesser Antilles, and so left these islands open for colonization by the English and French. The most repulsive practice among the Caribs was their eating human flesh, although in other respects they were far more advanced than the tribes of the forests of the Amazon.

When the Spanish explorers came into closer touch with the nations of the mainland, they found in Peru and Columbia, in Yucatan and Mexico, people who had inherited an ancient civilization. These people built

remarkable houses, temples, and pyramids of hewn stone; they had a system of hieroglyphic writing; they wore elaborate clothing of woven cloth, sometimes wonderfully embroidered with birds' feathers; they had domesticated the llama and the dog, the turkey, and a species of duck; and they cultivated, with knowledge and success, many useful crops, such as maize and potatoes.

How long before the Spaniards discovered them had these natives attained this state of civilization we have no means of telling. There are still remaining in Yucatan and Guatemala vast ruins of temples and cities which were ancient ruins then, the hieroglyphic inscriptions sculptured on them being even then quite indecipherable by the people living among them, though they had their own system of picture-writing. Like the ancient empires of Assyria and Egypt, the prehistoric empires of tropical America had been swept away, and because of their isolation they left but little trace of the sciences they evidently possessed, or of the arts which they must have skilfully practised.

X.—MAGELLAN AND THE PACIFIC

Vasco da Gama had shown the way by sea, round the Cape of Good Hope, to India and to the treasures of the East. Columbus, by the discovery of America, had made known a new world on the other side of the Atlantic; but between the farthest point eastward reached by the Portuguese and the western coasts of the newly discovered American continent there stretched an unexplored ocean.

It was left to a Portuguese sailor, in the employment

of the King of Spain, a sailor whom we know as Magellan, to be the first to dare to cross this ocean, and to try to circumnavigate the globe.

By the year 1512 the Portuguese had sailed as far east as the Moluccas, and had found in those islands the original home of the most valued spices, nutmegs and cloves.

Among the earlier Portuguese adventurers in the Spice Islands of the Malayan archipelago was Magellan. Thinking himself unjustly treated by the King of Portugal, Magellan went over to the service of the ruler of Spain, the Emperor Charles V, and to him he made known his plan of finding a way round South America, and so completing the original plan of Columbus of reaching the East Indies by sailing westwards across the Atlantic. If this were done, Spain might at least share with her rival Portugal the spice trade.

His proposals were agreed to, and he was put in command of a fleet of five small ships, the largest of which was only of 120 tons burden, and the smallest 75 tons. In September, 1519, he left Spain to search for a passage round or through South America to the Southern Sea.

Magellan crossed the Atlantic, and sailed southwards along the east coast of South America, looking for an opening which should lead to the other side. He thought that he had found it in the great estuary of the Rio de la Plata, but as soon as he noticed that the water was fresh, he continued his voyage southward. At last there appeared a likely opening between the mountains of Patagonia and the cliffs of Tierra del Fuego. Following the tortuous channel, the three ships that remained to him—for one had turned back, and another had been wrecked—came out of the straits into the open sea at

the end of November, 1520. The sea into which he had come seemed to him so peaceful, after the tempests he had gone through in the Atlantic, that Magellan gave it the name which it still bears, the "Pacific" Ocean.

From the south coast of Patagonia the little squadron sailed north-west across the Pacific for ninety-six days without sighting land, until they reached the island of Guam, in the Ladrones group. These islands were called "Ladrones", or thieves' islands, by Magellan on account of the dishonesty of their inhabitants. There are two very striking facts about this voyage: first, that none of the many groups of islands in the South Pacific, which Magellan must have passed at no great distance, were sighted by him; and second, the wonderful determination shown not only by the commander, but by all the men, who were reduced almost to the verge of starvation before they could obtain fresh supplies of food and water.

Magellan soon left Guam; and shortly afterwards discovered the Philippine Islands, where he remained for several months, establishing friendly relations with most of the native rulers. However, in April, 1521, when making an attack upon a hostile island, Magellan and many of his men were overpowered and killed.

There were now only two ships left, with 115 men, one of the three ships that entered the Pacific having been burnt. These sailed southwards to the coast of Borneo, and thence to the island of Timor. There one of the two remaining ships was so badly damaged that she had to be left behind with most of her crew. The last of Magellan's ships, the *Victoria*, at length, in February, 1522, sailed from Timor, laden with cloves and nutmegs. After very terrible sufferings on account of storms met with, both in the Indian and Atlantic

oceans, and especially of one encountered in rounding the Cape of Good Hope, and on account also of the spoiling of their provisions, eighteen survivors of the memorable expedition landed at Seville from the *Victoria*, in September, 1522, three years after they had set out.

It was a memorable expedition. The plan of Columbus had been at last carried out. Men had sailed from Europe westward to the farthest East, and round the globe back again. The ocean had been proved to be the great road which united the most distant lands with one another.

XI.—WHAT THE EARLY EXPLORERS WENT FOR AND BROUGHT BACK

We are so used nowadays to the idea that in all civilized countries the products of every region of the globe are easily obtainable, that we probably lose sight of the fact that this is owing to the easy communication by sea between one part of the world and another, and of the equally important fact that this easy communication has been rendered possible by the discoveries of the navigators of the 15th and 16th centuries.

The desire to obtain the products of the tropics led in the first instance to the undertaking of these venturesome voyages. Such productions as sugar, spices, strong perfumes, delicate fabrics of silk and cotton, valuable woods, such as ebony, cedar, and other hard and scented woods, precious stones, and precious metals were able to be obtained mainly from the warmer regions of the world—regions which lay outside of that European civilization the centre of which was the Mediterranean.

Sugar is such a widely consumed article of food now,

that it is hard to think that before the way to India by sea was opened, it was an article of the greatest rarity and luxury. Before that, honey was the sweetener in common use among Europeans. One can easily understand that only a couple of hundred pounds or so of sugar could be transported overland on the back of any animal in a caravan. A ship, however, even the small ship of the 15th century, could bring back many tons of this desirable and profitable article.

Again, it was the same with regard to spices, such as cloves, nutmegs, and cinnamon, and with regard also to the other valuable products of the East. A few pounds of spices, a few bales of silk, a log or two of valuable wood, a tusk of ivory, or a bar or two of gold or silver, made a load for any beast. But one ship could, and did, carry the load of a whole caravan. It is no wonder that, once the possibilities of traffic in such merchandise by sea were realized, the desire for wealth stimulated the activities of merchants and sailors, so that year after year they followed in the tracks of the first great explorers, and brought back to Europe cargoes of immense value. For instance, the cargo of cloves which the *Victoria*, the only surviving ship of Magellan's squadron, brought back, not only paid for the loss of the other four ships, but also put a substantial profit into the King of Spain's treasury.

As the other tropical parts of the world were opened up it was clear that many of the valuable products of the East might be grown in the western tropics, and be got from there more easily and more abundantly. Thus the Portuguese took plants of the sugar-cane from India to Brazil, and from thence its cultivation was extended through the West Indies, and soon became the

most profitable industry of the tropics. The vast profit made on sugar from the sugar-cane led to investigations into other plants as a source of sugar, and so was laid the foundation of the beet-sugar industry in temperate climates, which has been in later years so formidable a rival to the cultivation of the sugar-cane. This is a striking instance of how communication between different parts of the world has led to results of far-reaching industrial importance.

Another instance of the transference of a great industry from one part of the world to another, as the result of communication, is that of cotton. Up to the time of the discovery of America, the fine cottons of the East were the only fabrics of the kind known in Europe, and they were rare and valuable. Columbus found that cotton was a native of tropical America. The result has been that cotton has become the most widely used of any material for clothing throughout the world, and that by far the largest supply of this material is produced in America.

Besides the bringing into more general use articles which were known and valued from ancient times, another result of the discoveries of the great explorers has been the bringing to the knowledge of Europeans, and consequently into use by them, of products of the tropics which were unknown before, and which have become of the greatest importance to the whole world since their value has been recognized.

When we think that rice and maize and potatoes are, one or other of them, among the commonest foods all over the world to-day, it is hard to realize that they have become so only since the discoveries of the 15th century. Rice was known to Europeans. but was scarce and dear.

Maize was discovered to be a chief source of food among the natives of America, and its cultivation has been extended all over the world wherever the climate will allow of it. The cultivation of maize, since its discovery in America, has even penetrated beyond the bounds of civilization; and the plant has been found in use in regions of Africa only recently explored. The potato was brought to Europe in the early years of the 16th century, and has become a staple crop throughout the countries of the temperate zone of the Old World from Ireland to China.

Again, it is worth while to remember that the widespread use of articles which were at first luxuries, but have become almost necessities for a large portion of mankind, has now, too, become possible by the extension of communication by sea. Coffee, for instance, originally grown in Abyssinia and Arabia, is now most largely cultivated in Brazil, and is universally used throughout the world as an almost indispensable beverage. The same is the case with tea. It was cultivated in China from ancient times, but the use of it was unknown in Europe till the 17th century, and it is to be met with now in the cups of the civilized world, as the drink which it would least like to part with.

Another plant which the early voyagers found in use among the natives of America, in almost every part of it, was tobacco. Its soothing properties soon induced the Europeans to employ it, and from Europe it has passed into use throughout the world, even the most conservative of Eastern nations having been conquered by its attractions. Thus the "pipe of peace" of the American Indian is the universal symbol of lazy quiet throughout the world.

XII.—GOLD

“Commerce can never be at a stop while one man wants what another can supply; and credit will never be denied, while it is likely to be repaid with profit”, wrote a noted 18th-century author. Yet trade or commerce must for long ages have been carried on under what seem to us difficulties almost impossible to overcome.

Here is what we are told by travellers takes place among primitive peoples when they wish to exchange their goods. By the side of a stream, or on the slope of a hill, the articles the one tribe wishes to offer to the other are spread out. Then come members of the other tribe; and they, having examined what is offered, go back to their fellows to report. After a consultation with the rest of the tribe, they return, and lay down what they think fair and what they are willing to give in exchange for the goods brought by the others. If this satisfies the sellers, it is taken up, and they move away, leaving the goods laid out for the others to carry off. If it is not thought enough, the sellers retire, leaving the buyers to add to their offer if they consider it worth while. If no bargain can be struck, they take up their goods and move away, leaving the intending purchasers to pick up the stuff they have offered; but this seldom happens.

This is a very primitive form of barter; but barter is, it must be remembered, the only way of trading known to primitive peoples. An agreement that the members of the tribes should meet without arms at some place indicated, and there exchange their goods, gave rise to

those fairs which till recently were so important in the trade of the world.

Some advance, or the appearance of some advance, in the way of buying and selling goods described, is shown in the following story by a traveller in Africa of how in his experience corn was bought: "A small farmer who brings his corn to the Monday market in Kukawa will on no account take his payment in shells, and will rarely accept of a dollar". Cowries and dollars were the money in use there at that time. "The person, therefore," he goes on, "who wishes to buy corn must first exchange a dollar for shells; then with the shells he must buy a shirt, and after a good deal of bartering he may thus succeed in buying the corn he needs."

In this story the traveller shows us the difficulties of a system even of partial barter. We see that it would greatly help matters if we could find something that everyone would like to have, and for which he would be willing to exchange his goods; something that would at the same time be able to be used as a measure of value, that is, as a unit in terms of which men could state the worth of the objects they wished to sell.

To the world in general, more especially, if it did not actually arise there, to the Eastern world, where for a long time civilization was most advanced, cattle were such a commodity, and a man's wealth was estimated by the numbers of his flocks and his herds, and the value of an article was expressed in terms of oxen or sheep or goats.

Such, if you read the story of Jacob, you will find was the wealth which he brought from Padan-aram: "And he carried away all his cattle, and all his goods which he had gotten, the cattle of his getting which he had

gotten in Padan-aram". There were such great difficulties in the use of cattle as a measure of value, that as civilization advanced it led to the substitution of things that could more easily be divided, that were less perishable, and that were still generally desirable, either on account of their beauty and scarcity, or on account of their usefulness.

Even in ancient times men and women were in the habit of wearing things to make themselves look more imposing or more attractive. Ornaments of gold and of silver, on account of their brightness, and on account of their durability, were everywhere in great demand, and, by and by, the recognized desire for these was so general that they came to be substituted for the corn, oil, or cattle that had previously been used as measures of value. In *Quentin Durward* Sir Walter Scott tells us how Ludovic Leslie paid for services rendered him by one or more links from a gold chain he wore. And such a method of payment was undoubtedly very common in the Middle Ages.

The ability to be broken up, or divided with no loss of value, at any rate with a very small loss, made the precious metals, as they are called, gold and silver, a very suitable means of exchange, and at the same time a satisfactory measure of value. For a long time merchants carried about with them scales in which the gold or silver they paid for the articles they bought at fair or market was weighed; and the value of the articles bought and sold soon began to be expressed in the weight of gold or silver they brought. From the accounts of events on the goldfields we learn that a somewhat similar method is still followed by the gold-miners, who employ their gold-dust instead of coins.



Market-place in a West African Town

Other metals besides gold and silver have been employed at different times and in different countries as money. Iron seems to have been widely used in early times, not only by the Greeks, but by the Chinese and Japanese. The use of copper as money has been much more general. For long it was the only money used in Rome; and it is still used as a part of the token coinage of the British Empire.

Gold and silver have been found in many parts of the world; but in ancient times they were found chiefly in the tropical and sub-tropical parts, in India, Egypt, Arabia, and Persia. Even now it is the same; the gold mines of South Africa and of Northern Africa, of Australia, India, and North America, all lie in the tropics or in sub-tropical parts. Of course there are exceptions. The Klondyke mines in recent times are a fair example of these, and so also are the other mines of Canada and those of Siberia; but the yield from these is trifling in comparison with the yield from the mines of the Transvaal, of Western Australia and Queensland, of India, Mexico, and California, to name only a few of the tropical or sub-tropical regions in which gold is found.

Silver, like gold, was reckoned a precious metal, and like gold is widely diffused. The world's stock of silver and gold was largely increased by the discovery of America. Silver was, till well on in the 19th century, produced most abundantly from the mines of Mexico, Bolivia, Peru, and Chile, though Spain and Norway continued to yield silver. Since the middle of the 19th century the western part of the United States and the provinces of New South Wales in Australia have also been large producers of silver.

XIII.—DIAMONDS AND SPICE

Even in very early times men and women seem to have put a high value on bright objects. Bright shells, bright stones, bright metals, when these were discovered were all in great demand. It was no doubt on account of their beautiful colour, as well as on account of the ease with which they could be shaped into rings for ears and noses, into collars for the neck, and into armlets and anklets and other adornments for the person, that the precious metals were so eagerly sought for in early times. Possibly also some magic charm, bringing the owner good luck, was thought to dwell in them.

But certain precious stones, on account of their colour, on account of their brightness and of their hardness, and specially on account of certain magic qualities they were supposed to possess, were prized even more than gold and silver, and were therefore more sought after. So highly prized were they, in fact, that they were eagerly searched for by the people of old for use in adorning the sacred images in their temples, as well as for decorating the persons of their kings.

In ancient times these precious stones—diamonds and rubies and emeralds—were brought to Europe mainly from India and Ceylon. All over Europe in the Middle Ages the fabulous wealth of the diamond mines of India was a byword, and from India came all the larger stones famous in ancient times. Pearls were different. Like precious stones they were highly prized, but they were found in Europe itself, though the specimens found in European rivers and seas could not compare with those found in tropical waters. In Roman times Britain was noted for its pearls. After the discovery of America,

precious stones were found in Brazil, and pearls in great abundance in the Caribbean Sea. But the diamond mines of Brazil are not now to be compared with those of South Africa, which has the richest diamond mines in the world.

When the Spaniards and Portuguese settled in America they hunted specially for gold and silver and diamonds, and one effect of the existence of these in the New World was to draw to its shores adventurers who would, without the possibility of getting rich quickly which the known existence of these offered, have remained quietly at home.

In more recent times, the discovery of gold in California and Australia, and of diamonds in South Africa, had a similar effect; yet the fruits of California and the wool and cattle of Africa and Australia are more enduring sources of wealth.

The diamond is beautiful and very valuable, but it could never be used like gold and silver as money. Gold and silver can be broken up into smaller pieces without loss of value, but not so the diamond. If a stone be broken in two, the united value of the two is only a very small fraction of the value of the original stone.

From the pearl fisheries of the Caribbean Sea and Gulf of Panama, and from the gold and silver mines of the West Indies and of the New World, the people of Spain drew for generations untold wealth, as they thought, only to find themselves, in the end, one of the poorest peoples in Europe. Still, it was largely due to the gold and silver imported from the New World that Spain was able, from the beginning of the 16th century to the beginning of the 19th, to play such a great part in the history of the world.

It was not only from the gold and pearls and diamonds of the East that the Turkish conquest of Constantinople cut off Europe, or very nearly cut it off. "As bountiful as mines of India" is how Shakespeare makes one character in *Henry IV* describe another.

"High on a throne of royal state, which far
Outshone the wealth of Ormus and of Ind,
Or where the gorgeous East with richest hand
Showers on her kings barbaric pearl and gold,
Satan exalted sat, by merit rais'd
To that bad eminence",

is Milton's description of the surpassing splendour and wealth of the arch-enemy of mankind.

But the East was also famous for its rare fruits, its gorgeous dyes, and its delicious spices and perfumes.

"I must go buy spices for our sheep-shearing", says the Clown in *The Winter's Tale*, showing thus how general the use of spices was, and how much of a necessity they had become. All "the perfumes of Arabia could not sweeten" Lady Macbeth's blood-stained hand. The spices of India and the East were alike partially cut off by the progress of the Turkish arms; and it was largely to secure these, that men risked their lives in voyages westward and southward over unknown seas.

While almost all the spices in use in Europe during the Middle Ages came from India, and from the islands lying to the east of India, they had been so much in demand that from very early times a regular trade in them had been set up. This trade was carried on by way of Persia and Syria, and by way of Turkestan, and the Caspian and Black Seas, and was almost entirely in the hands of the Venetians and Genoese in the Middle Ages. There was also a sea route by which spices were

sent by Arabia and the Red Sea and through Egypt, but this route also was interfered with by the Turkish conquests, which were extended to Egypt in the first quarter of the 16th century.

The cultivation of such spices as nutmeg, clove, cinnamon, ginger, mace, has been carried on in the East for thousands of years, and for centuries these spices have been used in Europe. "I must have saffron to colour the warden pies; mace; dates?—none, that's out of my note; nutmegs, seven; a race or two of ginger." So says the Clown in *The Winter's Tale*, showing thus how general the use of spices was in those days.

All these, it will be seen, came from the tropical East, but with the discovery of the New World some additions were made to the spices in use. Vanilla is got from Mexico, pimento from Jamaica, and the capsicum or red pepper is found throughout tropical America.

The growth of spices and their preparation for the market is an important part in Eastern farming. Spices are generally, like allspice or pimento, and "Jamaica pepper", the product of trees or shrubs, and are cultivated like fruits. In the preparation of the spices, sometimes the fruit, as in the case of vanilla, cardamoms, pepper, and pimento, is the part used; sometimes the unopened flower-bud, as in the case of cloves; sometimes the bark, as in the case of cinnamon and cassia; and sometimes the thickened underground stem, as in the case of ginger.

The spices are generally prepared for the market either by drying, and afterwards reducing to powder, or by distilling. Sometimes one of these ways, sometimes the other is used in dealing with the same spice, the way followed being determined by the use to which the spice is to be put.

Spices were probably much more used in Europe in the Middle Ages than they are now, and the demand for them led to curious results sometimes. The Dutch, who wished to secure a monopoly of the trade in spices, are said to have destroyed all the spice-bearing trees in the Eastern islands, save those under their own control.

One of the most curious results of the struggle for the trade in spices was the formation of the East India Company. The Dutch raised the price of pepper from 3s. to 8s. a pound, so English merchants determined not to pay what they reckoned an unfair price, but to establish for themselves a trade directly with the East. With this end in view the East India Company was founded, and this led, as you know, to the great Indian Empire of to-day.

XIV.—NUTMEGS AND MACE

The group of islands known as the Moluccas, the most eastern group of the great East Indian Archipelago, are often called the Spice Islands, because they are the original home of the tree which produces the two important spices, nutmeg and mace. These spices were unknown to the ancient Greeks and Romans, although the word mace is said by some to come from a Greek word, which was used as a name for the aromatic bark of quite another tree. The English word nutmeg is derived from an old English term, which means "nut of musk". In the 12th century, however, these spices, along with the other spice products of the East, are mentioned in Europe.

The Portuguese, after their settlement in the East

Indies, had the trade in these spices altogether in their hands until the Dutch took it from them. The Dutch tried to keep up the price of nutmegs and mace by the short-sighted policy of destroying the nutmeg trees in all the islands except a few.

In order to break down the Dutch monopoly in this spice, nutmeg growing was established in Penang about the middle of the 19th century, and the product of the plantations in that island gained a reputation which has never been lost.

The Dutch East Indian Islands still continue the cultivation, and still produce the larger portion of the world's supply, although they have lost the monopoly.

From the East Indies the plant has been taken into many other tropical countries; but with the exception of some of the West Indian islands, notably Grenada, its cultivation has not become of any great importance.

It has been said that the nutmeg tree, in order to flourish, "must smell the sea", and it is noticeable that all the places in the tropics where its cultivation has proved profitable are islands.

The nutmeg tree is not naturally a tree of the open country, but rather of the jungle, and it would seem that the best results are obtained by growing nutmegs under the moderate shade of other trees.

Nutmegs are borne on a bushy tree, which seldom reaches a greater height than from 20 to 30 feet. The branches of this tree usually begin spreading from near the bottom of the trunk, so that the tree looks like a rounded pyramid of bright-glossy-green leaves. When it is in fruit it is a very handsome object; for thickly sprinkled about the bright-green foliage are the fruits, which are globular or oval-shaped, apricot-coloured, and,

when ripe, split in two, showing within the fleshy husk the polished black shell of the nutmeg. The latter is covered with a coarse lace-work of crimson mace, and the contrast of colour is very striking and pleasing. This description applies to a fruiting specimen of the



1, Nutmeg Plant—foliage and flowers. 2, Fruit split open. 3, Section of Nut.
4, Section of Flower.

tree. In a nutmeg plantation, however, trees may be observed which never bear fruit. This is owing to the fact that the nutmeg is one of those plants on which the flowers producing the pollen are borne on one plant, while the flowers containing the immature fruit are borne on another. In the nutmeg the flowers are incon-

spicuous, and the male flowers are very much like the female, which develop into fruit. The female flowers are probably fertilized by insects, which carry the pollen from the stamens of the male plants to the pistils of the females. Hence a certain proportion of unfruiting male plants is necessary in every plantation.

The most valuable product of the nutmeg tree is the mace, which is a crimson network lying over the shining seed-coat—the *testa*. This network, attached to the base of the seed, is known to botanists as an *aril*. Within the horny *testa* lies the oval seed, the well-known nutmeg. Mace, however, has always fetched more per pound than the nutmeg itself.

When the fruit is ripe the apricot-coloured husk splits open, disclosing the nut with its crimson *aril* of mace. The fruits are then gathered, and the mace is carefully separated and dried by itself. When dry it becomes a dull-yellow colour, and it is packed into casks for export. The nuts are dried separately, until the nut shakes freely within the horny covering, which is then broken; the nuts are removed, and sorted into sizes, and are then packed in casks, ready for shipment to the markets of Europe and America.

XV.—CLOVES

It seems strange to hear that one of the valuable spice crops of the world consists of unopened flower-buds. Yet that is the case with regard to the spice we know under the name of cloves. They are the unopened flower-buds of a small tree belonging to the same order

of plants as the myrtle and the guava. The tree is a native, like the nutmeg, of the Moluccas or Spice Islands.

The Chinese appear to have been the first to discover and value this spice, for it is stated in one of their writings, dated about the middle of the 3rd century B.C., that the "little sweet-scented nails" ought to be held in the mouth of any subject addressing the Emperor. The resemblance of cloves to small nails evidently struck the fancy not only of the Chinese, but also of the European nations, when this spice was introduced among them. The English word clove, together with the names for the spice in most European languages, is derived from the Latin word which means a nail.

As was the case with the trade in other Eastern spices, the Portuguese practically held the control of it from the end of the 15th century till the beginning of the 17th. The Dutch then made themselves masters of the Moluccas, and as has been mentioned in the case of the nutmeg, they tried to confine its production to one or two islands.

The East seems to claim a natural monopoly in spices. The real and only successful rivals in the production of cloves to the Moluccas are the islands of Zanzibar and Pemba, on the east of Africa. An Arab trader between Mauritius and Zanzibar took some clove plants to his native island at the beginning of the 19th century, and so laid the foundations of the extensive cultivation of the tree in Zanzibar and the smaller neighbouring island of Pemba, where clove production forms the source now of their most important trade, and provides three-fourths of the world's supply of this spice.

In only one other island, and that also an Eastern one, has the clove industry attained any importance. At the end of the 18th century clove plants were introduced

into the island of Penang. By the middle of the 19th century the clove plantations there were flourishing, and the product of them gained a reputation of superiority over that of the Moluccas and Zanzibar, which it still maintains in the spice market.

As it is said of the nutmeg that "it must smell the sea", so it is said of the clove that "it must see the sea". Apparently they only flourish in islands. They need a tropical climate, abundance of rain, and well-drained soil at no great distance from the sea-coast.

The clove tree is grown from seed in nurseries in baskets or bamboo pots. When the plants are of a sufficient height they are transplanted into their permanent positions. The young trees must be kept free from weeds, but manuring is not much resorted to. An occasional light pruning of inner branches, if growing too close together, and a sharp look-out against insect and fungus pests, are what the clove planter must chiefly look to until his trees begin to flower.

The tree begins to produce flower-buds from five to six years after planting. In its twelfth year its bearing powers are at their best, and it seldom continues to bear beyond its twentieth year. The buds are gathered during three or four months in the latter part of the year, each tree being picked over three or four times during that period.

The trees do not grow to a great height; generally speaking, they are about 15 to 20 feet high. The branches do not spread widely, so that the tree is usually shaped like a slender cone. The leaves are of a dark shining green, and are narrow lance-shaped, and very fragrant when crushed. The flower-buds grow on the ends of the branches, in small bunches of eight

or nine. They are green at first, turning yellowish, and finally a dull blood-red; and then they are fit for gathering.

The buds are gathered by hand, hooked sticks being used to pull the higher branches within reach. Step-



1, Clove Plant. 2, Flower-bud. 3, Section of Flower.

ladders are also used to get at those at the top of the tree, care being taken not to break the rather brittle branches, as rough treatment may prevent their bearing well for some years.

The buds, after having been gathered, are spread out on mats to dry in the sun, or they are dried by artificial

heat. The stalks and bits of leaves are then separated from the cloves, which are packed in bags for export.

Cloves are chiefly valued as a spice; inferior cloves, however, together with the flower-stalks separated from the cloves after drying, are employed for distilling oil-of-cloves. This oil is used largely in perfumery, and is also employed medicinally.

The tree is, as a whole, very aromatic. The foot-stalks of the leaves have nearly as pungent an odour as the calyx of the flowers. A writer of last century declares that clove trees make an almost matchless avenue to a house: "Their height, the beauty of their form, the luxuriance of their foliage; and, above all, the spicy fragrance with which they perfume the air, produce, on driving through a long line of them, a degree of exquisite pleasure only to be enjoyed in the clear, light atmosphere of the Eastern Archipelago."

XVI.—GINGER, CARDAMOMS, AND RELATED PLANTS

While, after the 16th century, the facilities of intercourse between the different parts of the world favoured the introduction of plants from one country to another, and the cultivation of valuable spice-bearing plants was taken up in different parts of the tropics, tropical Asia still remains the chief source from which the world obtains its spices.

There is an order of plants known as Scitamineæ which is almost entirely confined to tropical regions. They are remarkable for possessing in most species

thickened underground stems, or rhizomes. Some of the American species contain in these rhizomes abundant supplies of starch, like the well-known arrowroot, cultivated in the West Indies, its native country, from the rhizomes of which a very pure starch is obtained. Some of the East Indian species, however, are cultivated for the sake of the pungent aromatic principles contained in the rhizomes and seeds.

The most extensively cultivated plant of this class is ginger. Our English word is derived from the Sanskrit name of the spice, through the Greek. This shows that the plant was known and cultivated from very ancient times in India, and was also known and valued by the Greeks as one of the precious spices they obtained from the East. Shakespeare, in *Twelfth Night*, makes Sir Toby ask Malvolio: "Dost thou think, because thou art virtuous, there shall be no more cakes and ale?" To which the Clown, before Malvolio can reply, answers: "Yes, by St. Anne; and ginger shall be hot i' the mouth too."

Ginger is not known anywhere nowadays as a wild plant, but its cultivation is very extensive in India and China. It was introduced into the West Indies early in the 16th century, where it flourished, so that in the 17th century, before Jamaica was conquered by the English, that island exported annually to Spain many thousands of pounds of ginger. Jamaica still remains one of the large sources of the supply to the world of this universally used spice.

In India ginger, on account of its biting aromatic flavour, is an indispensable ingredient in the preparation of the condiment called curry powder, which is used in flavouring all sorts of dishes, both of vege-

tables and of meat. It is also used in medicine as a tonic for the digestion. Its employment in both these ways is now universal, and in more recent times great



The Ginger Plant, showing Rhizome or Root-stock

quantities have been used in Europe and America for flavouring cakes and confectionery, and in the preparation of the well-known refreshing and slightly stimulating drinks, ginger beer and ginger ale.

The spicy principle of ginger is contained in the

rhizomes. In order that these may develop fully, the plant must have a suitable soil, rich and loose. It very soon exhausts the soil in which it is planted, unless due care is taken to manure and till it efficiently.

The rhizomes of ginger in China have been developed to a greater degree of succulence, with a loss of some of their pungent quality. Hence the Chinese have almost the monopoly of the sort of ginger which is used to make the sweetmeats known as preserved and crystallized ginger.

Ginger is always grown from cuttings of the rhizome, which being an underground stem, possesses leaf-buds. From these cuttings spring the leaf and flower stalks of the plant, and a further development of rhizomes, the future crop. The leafy stems which are produced from the cuttings grow about 2 feet in height, and are covered with the sheaths of the leaves. The flowers, usually arising on separate stalks from the root-stock, are produced between pale-green bracts forming a cone of about 3 inches long, the flowers themselves being yellowish white. Often, however, no flowers are produced, and the ginger plant seldom seeds.

When the stalks and leaves begin to turn yellow, the rhizomes are lifted from the soil with a fork, care being taken not to bruise them. The stalks are removed, and the rhizomes are then washed, and dried in the sun, and often shipped without further preparation. It is necessary, however, that the rhizomes should be thoroughly dried, otherwise they would mildew, and their value be lost. The best Jamaica ginger, however, is carefully scraped very lightly before drying.

Another of the East Indian plants of the same order, cultivated as a spice, is the cardamom. This is, however,

entirely cultivated for the sake of the seeds, which are distinguished for their spicy fragrance and taste. Its use as a spice is not nearly so widespread as that of ginger; and, in fact, most of the cardamom crop is consumed in India and the neighbouring countries, as an ingredient of curries and a flavouring of sweetmeats. The appreciation of it seems, however, to be increasing among western peoples. Although the cardamom is cultivated with great profit under suitable conditions, the greater part of the crop is got from wild plants. In this it differs from ginger.

The cardamom plant grows somewhat similarly to the ginger, but to a much greater height. The leaves produced on the stalks, which grow in thick clumps, are much longer and broader than those of the ginger. The appearance of the plant is very like that of the ornamental *Alpinia*, cultivated for its flowers in many parts of the tropics, and known often as "Paradise" or "Shell" plant.

The plant needs a warm, moist atmosphere, and a considerable degree of shade. These conditions are found in its native woods in tropical India. Portions of the forest where the cardamom grows are thinned out, and the undergrowth removed, and then the cardamom plants grow up from seeds scattered naturally under the trees by birds, needing only to be thinned out here and there. After the plant has flowered, as soon as the capsules are fully developed, but before they are quite ripe, they are carefully cut off and dried. These constitute the cardamoms of commerce.

There are two other plants of the same order, natives of tropical Asia, which are also used, though not to the same extent as the two dealt with above. These are

the turmeric and the galanga. As with ginger, so in the case of these, it is the rhizome that is the valuable part of the plant. The cultivation of these is very similar to that of ginger. As spices they are not held generally in very high esteem, but in the countries where they are grown they are used very largely. Besides its spicy property, turmeric possesses in its rhizome a valuable yellow vegetable colour. It was known in Europe in the Middle Ages as "Indian saffron", and was employed for very much the same purposes as the true saffron. Aniline dyes have in recent years largely replaced such vegetable dyes commercially; but turmeric is still valued as a pleasing colouring matter for sweetmeats and other dishes.

Galanga, which is a plant very similar in its appearance to cardamom, is not much used in the world outside of Asia. Its rhizomes contain an aromatic principle for which it is valued, especially among the Chinese.

The methods of planting, reaping, and preparing for the market the rhizomes, both of turmeric and galanga, are very similar to those employed in preparing ginger; cleanness and dryness of the product being essential to obtain good prices in the market.

XVII.—CINNAMON AND CASSIA

The use of the aromatic barks of cassia and cinnamon, as spices and perfumes, can be traced back to the very earliest times. Both of them are mentioned often in the Old Testament Scriptures, and also in the writings of the first of Greek historians, Herodotus.

But much further back even than that we find that they were known and valued. In Egyptian writings of the 17th century B.C., mention is made of a spice bark being brought from the East, which was evidently one or other of these. The Chinese, indeed, claim to have cultivated and made use of cassia bark as early as 2700 B.C.

Cinnamon is the product of a species of tree called by botanists *Cinnamomum*, to which the laurel tree of Europe, and the avocado pear of tropical America, are related. It is a native of southern India and Ceylon, where since the 18th century it has been cultivated. The ancient supply of the spice seems to have been got entirely from trees growing wild. Although the tree has been introduced from Ceylon into many other parts of the tropics, the only place besides Ceylon which produces real cinnamon in any appreciable quantity at present is Java.

The Portuguese took possession of Ceylon in the 16th century to obtain the monopoly of the cinnamon trade. They did the same, you were told, with regard to the spices of the Moluccas. The Dutch, too, when they expelled the Portuguese from their East Indian possessions a hundred years later, carried on the same policy of monopoly. In 1770 an enterprising Dutchman in Ceylon began planting large estates with cinnamon trees; and in this way greatly increased the supply, which was no longer dependent on the product of the forest.

When growing wild the cinnamon grows into a tree from 20 to 40 feet high, with bright-green fragrant leaves and inconspicuous flowers, producing an aromatic berry, which when ripe is much appreciated by birds.

When cultivated, however, the tree is kept pollarded at a short distance from the ground, in order to induce the formation of long willowy shoots, from which the best bark is peeled.

Although it may be easily reproduced from cuttings,



1, Cinnamon Plant—foliage and flowers. 2, Section of Flower.

cinnamon is more usually grown in Ceylon from seed. When the plants are two or three years old, the first crop is got by cutting the solitary stem off to within 6 inches of the ground. From the stump left will spring three or four shoots for the second crop, and the number of shoots increases each year till, in seven or eight years

time, the bushes attain such a size that the cinnamon peelers can hardly get between them.

When the shoots have been cut from the plant, they are stripped of their leaves, and trimmed into manageable lengths with a knife. The waste pieces are known as "chips", and from them oil of cinnamon is distilled. From the trimmed shoots the bark is removed lengthways in strips by means of a special knife. The strips of bark are collected in bundles and piled in heaps to undergo a slight fermentation. On the next day the peeler scrapes off the outer skin of the strips of bark with another small curved knife. The strips of bark, in drying, contract into what are known from their shape as cinnamon "quills" or "pipes". After having been sorted, and dried under a mat in the sun, these pipes are made into bundles and tied up in cloth for the market.

Cassia, which is a very similar spice to cinnamon, is only cultivated in China and in the Indo-Chinese peninsula. The real Chinese cassia is derived from a species of *Cinnamomum*, which, found wild in Cochin-China, has been cultivated in the southern districts of China from time immemorial. In cultivation it is treated similarly to the cinnamon, that is, it is kept pollarded to induce the formation of long straight shoots.

Cassia spice is also prepared in a similar way to cinnamon. Although the plant is only cultivated in China, a considerable quantity of the spice is obtained from wild trees of the same species in the Malayan islands and in the countries of Indo-China.

Cinnamon and cassia are both used as flavouring spices in many articles of food, particularly in the chocolate industry. Oil of cinnamon is employed by the perfumers, especially in the manufacture of scented soaps.

XVIII.—PEPPER

The term pepper is now used for the product of two very different kinds of plants. The name was at first given to the spice obtained from the seeds of East Indian plants which furnish what is known as black and white pepper, and the less-used long pepper.

The name pepper is derived through Latin from an Eastern word. Black pepper is the fruits of the pepper vine dried, while white pepper is simply the same fruits treated so as to deprive them of their dark outer covering.

The true peppers belong to a genus of plants found only in the tropics. They all, more or less, contain in leaves, or fruits, or stem, pungent aromatic principles, but only a very few are sufficiently aromatic to be used as spices.

Black pepper was one of the spices earliest known and most generally used in Europe. It is mentioned by Pliny, the Latin naturalist, in the first century. Pepper often formed a part of tribute or taxes in early times. Thus we read that Alaric, the Goth, in the year 408, exacted as part of the ransom to be paid by the city of Rome, to prevent his sacking it, 3000 pounds of pepper. Again, at the end of the 10th century King Ethelred of England ordered the merchants of North Germany who traded with his country to pay a tax, including 10 pounds of pepper, at Easter and Christmas.

The pungent taste of pepper, as well as its stimulating effect on the stomach, has caused it to become one of the most commonly used condiments in the preparation of food.

The original home of the pepper plant is southern

India, but soon after the Portuguese made settlements in the East they introduced the plant into Malacca, and into the islands of the Eastern Archipelago.



Pepper Plant, showing fruits ("peppercorns")

Although pepper can be grown in many other parts of the tropics, it has never been cultivated far outside its native India. Southern India, Indo-China, and the large islands of Borneo, Java, and Sumatra still supply

the world with pepper, as they have done for many hundreds of years.

In Travancore and in the forests of Malabar, where the pepper plant grows wild, it is found in the rich, damp, leafy soil of the narrow valleys. The plant multiplies itself by running along the ground and giving off roots which enter the soil. It is a climber which clings to a tree or other support by means of numerous short roots produced at the joints of the stem. The leaves are ovate in shape, and of a dark-green colour, with prominent veins. The flowers are very small, borne in slender spikes. The fruits, which are round, and well known as "peppercorns", are at first dull-green, becoming red when fully ripe. They do not ripen and turn red all at the same time on one spike, but when fit for picking they ought to be nearly all of about the same size. A good spike is about 4 inches long, bearing about fifty peppercorns.

Although pepper can be grown from the seed, yet the usual practice is to grow it from cuttings. Since the plant is a climber, supports have to be provided, one for each plant. In many places, trees which are of a quick growth, and which do not give a dense shade, are planted one alongside each pepper plant. In other places the supports consist of posts. As the vine ascends the tree or post it is tied to it with bast or twine. When it reaches the top, the vine is pulled back and wound round the base of the support. This process is repeated three or four times during the period of growth, with the result that the vine throws out more shoots each time, so that the support becomes covered at length with a bushy mass of stems and branches. Careful pruning is also employed to thicken the growth.

In about three years the vine ought to have completely covered the support, and to be in full bearing, which ought to continue for several years more.

When one or two berries on a spike are red, the spike is plucked by hand. In order to reach the top of the vines, the pepper gatherers use a step-ladder. The spikes do not ripen all together, and so the gathering goes on almost all the year round.

When the spikes have been plucked they are put into small baskets, and undergo a different treatment according to whether black or white pepper is to be made.

If black pepper is required, the baskets of spikes are plunged for a few minutes into boiling water, and then the contained fruits are spread out on mats to dry in the sun, or they are dried by artificial heat. As the pepper dries it becomes quite black, and then the stalks are separated by rubbing with the hand, and removed by winnowing. It is then ready for the market.

If white pepper is to be produced, the berries are put into large bags, and allowed to soak for a week or ten days in water. This causes the outer skin to become soft and loose. The berries are then placed in a tub with a little water, and stamped on and washed, till all the stalks, skins, and pulp are removed. The peppercorns are then dried as in the case of black pepper. Much white pepper is, however, made in Europe and America by passing black pepper through a special machine which rubs off the outer black skin.

XIX.—CHILLIES AND CAPSICUMS

Since the discovery of the West Indies and America by Christopher Columbus in 1492, one of the most striking facts in the history of the world has been the migration of human beings from Europe across the Atlantic, and their settlement in the New World, where they have flourished and multiplied. With them they brought invading armies of the domestic animals and the cultivated plants of Europe; and these, like their human associates, have also flourished amid the new surroundings.

On the other hand, there has been a remarkable counter-invasion of the countries of the Old World by plants brought back from America and the West Indies by the early explorers. Of rapidity of dispersal through the tropics and warmer temperate regions of the globe, the various species of capsicum, known also incorrectly as peppers, provide a striking example.

Capsicums belong to the same order of plants as the potato and the tomato. They are natives of tropical America; and no wild species has been found in the Old World.

Dr. Chanca, the physician who accompanied Columbus on his second voyage, and who wrote an account of it, mentions capsicum under its Carib name, as a pepper more pungent than that from the East. By the end of the next century capsicums had been introduced from Brazil by the Portuguese into their East Indian settlements. Many varieties of them are now cultivated and used throughout the tropics and the warmer lands of the temperate zone.

The various kinds of capsicum seem to possess wonderful powers of fitting themselves to new conditions, whether of soil or climate. The many varieties differ in size, shape, pungency, and colour of the fruit; but these differences probably all arise from hybridization between four or five original types or species.

On account of their pleasant, pungent flavour, the chief use of capsicums is as a spice. They are used fresh or dry, in pickles and curries; and when dried and powdered they become the red or cayenne pepper of commerce. Capsicums are most sought after in the tropics; and although not long introduced from America into other countries, the people, especially the poorer people, of most tropical lands look upon capsicums in some form or other as a condiment they can hardly do without. The easy cultivation and hardy nature of the plant, placing its product within reach of everyone, are probably reasons for its general popularity in the tropics.

The plant is a perennial shrub, with lance-shaped leaves of a thin texture. The flowers are rather small and inconspicuous, of a greenish-white colour. When, however, the fruit ripens, the shrub is often a conspicuous and handsome object, numbers of bright red or yellow fruits showing up in striking contrast to the light-green foliage.

For export it is necessary to dry the capsicums thoroughly. The fruits are picked from the plants when ripe or nearly so, and are then dried, usually in the sun. Most of the capsicums, or chillies as they are also called, used in Europe are shipped thither in a dry condition, whole. Then, if wanted to be manufactured into cayenne pepper, they are further dried, and reduced to the powder known by that name.

Although America is the native land of the capsicums, the East, the home of spices, seems to have adopted this exotic spice also, and as is the case with regard to almost every other spice, the Eastern tropics supply the world's demand for chillies or capsicums.

The cultivation of capsicums in India and Malaysia



Capsicum Plant, and single flower (shown separately on larger scale)

is quite a large industry; while from Zanzibar and Natal and Sierra Leone considerable shipments are made every year. The West Indies, whence they were first taken to Europe, hardly grow enough capsicums for local consumption, and this is the case also with the rest of tropical America.

XX.—VANILLA

The vanilla pod is the fruit of a climbing orchid found wild in Mexico and Central America. The name is derived from a Spanish word meaning a little scabbard, and also a small pod or husk, and was evidently suggested by the appearance of the pods. The wonderful beauty and extraordinary shape of their flowers cause orchids to be highly prized and much sought after by gardeners. The vanilla, however, is the only member of the family which is cultivated for the sake of its fruit.

Long before the conquest of Mexico by the Spaniards vanilla was used by the Aztecs, the ruling race, for flavouring their chocolate. Both the beverage and the flavouring were highly appreciated by the Spaniards, and their use was introduced into Europe in the 16th century. The cultivation of the plant, for the regular production of the pod, has only been undertaken in other tropical places outside of Mexico since the middle of last century.

This cultivation was first taken up in Java. Soon after, it was begun in the French colony of Réunion, whence it was introduced into the English colony of Mauritius. Since then the cultivation has spread widely through the tropics, becoming in some of them, like the small group of the Seychelles, one of the principal agricultural interests. Mexico still exports much of this valued spice or perfume, and the Mexican product fetches the best price, but the larger part of the world's supply of vanilla comes from other places in the tropics. The value of the pods consists in the presence in them of a substance known as vanillin, which is the cause of the

peculiar fragrance that renders vanilla so valuable as a flavouring for chocolate and confectionery, and also in perfumery, for which it is much used. The price of it, however, has fallen very much, chiefly owing to a discovery by some Dutch chemists that vanillin could be produced at far less cost than it takes to grow the vanilla pods it was got from. This substitute, however, lacks the complete fragrance of the natural product.

The vanilla plant, as was said before, is a climber, and has long, easily bent green stems, with fleshy, bright-green leaves. At each joint, opposite to the leaf, the stem puts out white aerial roots, by which the plant clings to its support. The flowers spring from the axils of the leaves in bunches of twenty or even more. The pods are at first green, turning gradually yellowish on ripening, and, if left on the plant, they become at last deep brown.

In cultivation the vanilla plant is always grown from cuttings. These are planted by the side of supports which the plant will make use of as it grows. The supports are sometimes made of posts with bars across at some height from the ground, but in most vanilla plantations trees are used for this purpose, especially trees which do not give a very dense shade, and which put out branches before growing very tall. The vanilla plant grows quickly, but does not produce flowers until it has reached the top of its support.

The work, on which the result of the crop depends, has to be done on a vanilla plantation when the flowers begin to open. These have to be fertilized by hand in order that the fruit may set. The instrument employed is only a small pointed stick of wood, or a splinter of bamboo, the size and shape of an ordinary toothpick.

After fertilization the flower soon drops, and the fruit begins to grow. As soon as a pod turns a little



Vanilla Plant, showing the pods and aerial roots

yellowish it is picked; this is daily work, because the pods do not all ripen at the same time.

When picked, the pods have not the fragrance that

marks vanilla. This is only got by them after undergoing a process of fermentation. The success of this curing depends to a great extent on the care taken; and on its success depends largely the value of the crop.

When the fermentation, or "sweating" as it sometimes is called, has been completed, the pods are sorted into classes according to size and colour, made up into bundles and packed into tin boxes, three or four of which are put into a wooden case for shipment.

The peculiar interest of vanilla cultivation, apart from the question of profit, is that it can only be successful by resorting to the artificial fertilization of the flowers. Man's fingers have to take the place of bees; and so, by following and imitating natural processes, man is able to reap as he should the harvest he desires.

XXI.—PERFUMES

The early explorers undertook their bold voyages not only to obtain spices, but to obtain also the fragrant perfumes, for which the East had been famous in Europe from the beginnings of history. They went in search of the sandal-wood, myrrh, frankincense, camphor, and other aromatic gums, and also of the almost priceless otto of roses. The trees and plants from which these substances are obtained still flourish in their native lands, and trade in these products still leads to the intercourse of the nations.

Some of these perfumes are obtained from the wood of trees, such as the sandal-wood. This tree is a native of India, and of some of the islands of the East Indian

Archipelago. The wood contains a very fragrant essential oil. From a mention of it in the old Sanskrit writings, known as the Vedas, it is evident that it was used as a perfume in religious services as early as the 5th century B.C. Its use for this purpose has never ceased in the East; and to mix sandal-wood with the other fuel for the cremation of a corpse is considered most desirable, whenever it can be afforded. The wood is also used for making small and elaborate pieces of furniture—highly prized on account of the lasting fragrance attaching to them. The essential oil has been extracted by distillation from chips and smaller pieces of the wood from prehistoric times in India, and was used, as it still is, to form an ingredient in the most fragrant perfumes and ointments.

For a long time this perfumed wood was only obtainable from India, and some of the islands in the Eastern Archipelago. After the exploration, however, of the islands of the Southern Pacific, it was discovered that a kindred species of tree grew in some of them. The determination to obtain cargoes of sandal-wood from these islands has led to many a fierce fight between the crews of trading-ships and the natives, and in many cases, it is sad to say, to acts of cruelty and oppression on the part of unscrupulous and greedy traders. Sandal-wood is still perhaps the most valuable of all woods, and efforts are being made to cultivate it in other parts of the tropics, where conditions seem to be suitable for its growth.

Another tree which produces one of the most highly prized fragrant substances is the camphor tree. This tree is grown in parts of China and in some of the Japanese islands, the largest supply of camphor coming

from Formosa. Camphor as we know it, is obtained by distillation from all parts of the tree—wood, bark, and leaves. This highly scented substance has always been held in great esteem, not only because of its fragrance, but for its disinfectant properties. In recent years scientific chemists have found out a way of making artificial camphor, and the camphor so made has become a rival in the world's markets to the natural article.

Others of the perfumes so valued of old were got from fragrant gums oozing from the bark of trees which grow only in the East. Such, for instance, are the myrrh and frankincense so often spoken of in the Bible. Both of these fragrant gums are got by making cuts in the bark of trees or shrubs, and from these the gum oozes. It hardens on exposure to the air, and is then gathered and further dried. Both the shrub which yields myrrh, and the tree from which frankincense is gathered, are grown in southern Arabia, and on the opposite coast of the Red Sea in Somaliland. These two perfumes have long been valued for mixing to make incense for use in religious worship, and also for embalming corpses—a rite so much practised by many nations of the Old World.

Perfumes got from sweet-scented roots were also some of them very precious. Spikenard, which, when mixed into an ointment, "was worth much", was probably got from a root grown in India. Orris root, which is grown in Italy, may be mentioned as another perfume-producing root.

To most people, however, the idea of perfume is chiefly connected with the scent of flowers. The most precious of these perfumes derived from sweet-smelling flowers is the otto or attar of rose. Not only is it the most

delightful of perfumes to modern tastes, but we find that the ancient Romans and Greeks thought almost as highly of it. To get the perfume, roses were cultivated in Persia long before the Christian era. The rose petals are distilled to produce rose-water, held in high repute medicinally in olden times, and also to produce the far-famed otto of rose, the price of which was immense. This rose culture for perfume manufacture was afterwards introduced into south-eastern Europe, and Bulgaria became the chief centre of production. Still later, this cultivation has had much attention paid to it in France.

Many other sweet-scented flowers yield perfume. The violet and the tuberose, for instance, are grown by acres in the south of France for the making of scent; and in India from the earliest historic times many fragrant flowers which are natives of the tropics have been cultivated for the perfumes got from them. Among these are the well-known jasmine, and a very fragrant species of acacia which has since become naturalized in many other warm countries, notably in the smaller West Indian islands. A simple way of fixing the scent of flowers has been to pass it through oil or fat, the oil or fat becoming charged with the scent. Perhaps many of the famous ointments of the Greeks and Romans were got in this way.

Not only the flowers but also the leaves of plants are employed for the distillation of perfumes. The lavender of Europe has long been cultivated for its fragrant leaves. In India the leaves of a tall grass known in English as "lemon grass" have been distilled for ages, as they still are, and a very fragrant lemon-scented oil is thereby obtained. The pimento tree, or "bay tree", of the West Indies yields from its leaves another fragrant oil which

is also extracted by distillation, and is much valued in the manufacture of perfumes.

The plants which supply these fragrant essences still grow and are cultivated in the warmer parts of the world. The change is that instead of being transported with difficulty, and in small parcels, on the humps of camels or the backs of mules from east to west, they are now carried by tons, and with incredible speed, in steamships all over the world.

The animal world also yields substances which are very largely used by perfumers in their art. Musk is one of these. This is a strongly-smelling substance contained in a gland in the body of a small species of deer which inhabits the mountainous regions of Central Asia. In its raw state the scent is so strong as to be very disagreeable to most people, but when mixed in small proportions with other substances it is an ingredient in many popular perfumes. The little deer which produces it is so persistently hunted that it is in danger of extinction. When the deer is caught and killed, the gland is cut out and dried for exportation. Another animal perfume, very similar to musk, is obtained from several species of the same class of animals as the mongoose. These are known as civet cats. One species lives in Northern Africa, and the others in the East Indian islands. The perfume is contained in an oily substance secreted in a small pouch of the animal's skin, and is squeezed out without killing the animals, and these are kept in captivity to get from them the substance yielding the scent.

XXII.—DATES AND FIGS

Man is naturally a fruit-eating animal: that is to say, fruit of some kind has always formed part of the food of human beings. Unlike cereals, however, fruits for the most part cannot be stored or transported easily over great distances, except by means of special appliances. Some fruits can be dried, and still retain their flavour and nourishing qualities. This is due to the sugar they contain, which acts as a preservative.

Among such fruit, which in their dried state are sent from the countries where they are produced all over the world, and are known and relished everywhere, are dates and figs. Dates are the fruit of a kind of palm tree; and they have been known and valued from prehistoric times in the warm, dry portion of the earth's surface, which extends from the basin of the Indus on the east to the western coast of Africa on the west, and between the 15th and 30th degrees of north latitude. From ancient Egyptian and Assyrian monuments, as well as from their earliest writings, it is evident that the date-palm grew in abundance in the valleys of the Euphrates and the Nile from the time of the beginning of civilization there. The oldest Greek writers mention the fruit as common in Babylonia and Egypt, and it is spoken of often in the Bible.

In those countries where the date has been cultivated for ages, the fruit forms a large part of the daily food of thousands. The tribes of the desert regions of Persia, Arabia, and North Africa may be said to live on a diet of dates for months, with a small amount of milk or meat added. Not only is the date very nourishing, but it is very palatable, and, when dried, keeps good for

long periods. Besides the use of the fruit as food, a wine is made from the sweet sap of the palm. This wine is got by making a cut in the terminal bud, and letting the sap flow from it into vessels placed to receive it. It is then fermented, and palm wine is the result. A much esteemed syrup is also made by the Arabs by boiling and squeezing the ripe date-fruit. The seeds are also used as a food, especially in times of scarcity, after having been pounded and boiled.

Because of its cultivation in that dry, almost rainless belt of the earth which has been referred to, it has been supposed that the date-palm is a tree which requires very little supply of water. The contrary is, however, the case. The large date-palm groves in all those countries are in situations which can be regularly irrigated, either naturally, by the overflow of rivers, or artificially. Even in the apparently waterless deserts, date-palms only grow on the oases where their roots can soon reach a supply of underground water. This supply of water has been found necessary for the successful cultivation of the tree wherever it has been introduced into other countries, as, for instance, in California and Arizona.

The wild date, as has been the case with all plants which have been long under cultivation, has been immensely improved, and nowadays there are scores of varieties cultivated which far excel the original fruit. Perhaps the most esteemed are those grown in the lower portion of the Euphrates plain, and shipped from Bassorah.

Although the date-palm grows freely from seed, seedlings cannot be counted on to grow true, that is to say that palms grown from seed do not always

produce exactly the same kind of fruit as the parent palm produced; and another difficulty with seedlings is that there is no way of knowing whether the individual seedling is going to be a male or a female. Only the females produce fruit. Hence the practice in the culti-



1, Date Plant. 2, 4, Male Flowers. 3, 5, Female Flowers. 6, Dates.

vation of dates is to grow new trees from the offshoots which arise at the base of the date trees. Those arising from female trees always produce fruit of the same type as that borne by the parent tree; and those arising from male trees always produce bunches of male flowers only. By the use, therefore, of offshoots the grower of dates

not only is sure of the variety of fruit which will be harvested, but can also regulate the proportion of male plants needed for the fertilization of the fruit-bearing flowers of the female trees. The offshoots are separated from the parent stems, their roots and leaves trimmed away, and they can be transported often to great distances. They are planted in rows, usually from 25 to 30 feet apart, and begin to flower under favourable conditions in about three years from the time they are set out.

The further cultivation of the date-palm does not seem to call for very much trouble or skill, except in the very necessary operation of pollination. As was noticed above, the date-palm is one of those plants in which the stamens, or pollen-bearing organs, are produced on one individual and the pistils and fruit on another. In a wild state, where male and female plants grow together, enough of the pollen is blown by the wind from the stamens of the male plant on to the pistils of the females to fertilize a large number of them. But the date-grower wants all the pistils fertilized if possible, so as to produce a full bunch of fruit. So from time immemorial he has helped in the fertilization. When the female flowers have just burst open the spathe or sheath which encloses the whole bunch, spikes of male flowers, which have also just burst their spathe, are shaken over the bunch of female flowers, and thrust down between them, with the result that grains of pollen rest on the stigmas of almost all, and a bunch of dates is produced which weighs, when ripe, sometimes as much as 50 pounds.

When the dates are ripe they are cut in bunches, as they ripen very evenly. In this fresh condition immense quantities of dates are consumed in the countries where

they grow. For export, however, they are allowed to dry for a short time spread out in the sun, and are then packed closely in boxes, which are shipped all over the world.

The fig, another dried fruit held in great esteem, and



Fruiting Branch of Fig

used as a chief article of food in the countries where it is grown, is apparently a native of Asia Minor, cultivated there and in the neighbouring regions from very early times. Thence its cultivation spread to the different countries round the Mediterranean, and spread also eastward into Persia and China. In reality the fig of commerce is not a real fruit at all, but is simply the enlarged, fleshy, juicy receptacle within which a number of tiny

flowers are borne, which produce, if fertilized by an insect, tiny hard nuts, the real fruits of the fig, which the people who eat it call the seeds. The edible fig in its many varieties has been introduced from the Mediterranean lands into many other warm regions; but it is still to its original home that the rest of the world looks for its supply of this delicious dried fruit.

There are many species of fig trees in the tropics, wild, or cultivated chiefly for their shade, but of none of these is the fruit worth eating. Among them is the famous banyan tree of India, and the bearded figs of the American tropics, which are remarkable for the aerial roots proceeding from the branches, and taking root in the ground beneath. The india-rubber tree, which was the first source of rubber, is another of the figs.

XXIII.—GRAPES

Like the date and the fig, the grape has been cultivated by man from very early times. Its cultivation can be traced back to ages of which we have now no written record. Seeds of the grape have been found in the lake dwellings of Italy and Switzerland, along with human remains. The fruit seems to have been cultivated in Egypt 6000 years ago; it was well known among the Greeks and Romans from long before the time of their earliest writings; and the Bible tradition seems to hint that it was cultivated first by the ancestors of the human races even before the prehistoric separation of the Aryans, Semites, and Hamites from one another.

There are many species of the vine found wild in

various parts of the world, but the species from which all the cultivated varieties of grape—though these are very numerous—have originated, is still found growing wild luxuriantly in the region between the Black and Caspian Seas—a region believed by many people to have been the original home of civilized man. The cultivation of the vine seems to have spread through Asia Minor, Palestine, and Egypt, to Greece and Italy. Gradually the cultivation of the grape spread over the whole of central Europe from the Mediterranean to the plains of Germany, from Spain to northern France; and from thence the cultivation has, in recent times, been carried to newly-discovered countries, to California in North America, to most of the States of South America, to South Africa, and to Australia. The grape has never been widely cultivated in Asia, except in Persia and the regions immediately south of it, and in some parts of India, as Kashmir. At the present day the vine is most largely cultivated, and the finest grapes are to be found, in Europe.

The typical grape-vine is a climber, clinging to a support by wiry tendrils. In large vineyards the support is limited to a post not very high, so that when kept pruned the plants become almost bush-like in form; in some cases supports are altogether dispensed with. The fruit differs very much according to the variety. Always produced in bunches from the axils of the leaves, the fruits vary in size, from a berry no bigger than a pea, to one the size of a small plum; in colour, from almost transparent yellowish green through shades of red and purple, to almost black; in flavour, from distinct acidity to luscious sweetness.

In planting the grape-vines, after the ground has been

thoroughly weeded, ploughed, and manured, holes are made at regular intervals, the distance varying according to the country and locality. These are filled with fine earth and good manure, and cuttings of about 12 or 16 inches in length are planted in them. Enough space has to be left between the plants for carrying on later the work of weeding, manuring, and careful pruning.

During their growth the vines are liable to be attacked by many enemies. The most deadly of these is a tiny insect known as *Phylloxera*, which attacks the roots of the vine, causing the fruit to wither, and the whole plant to die. This pest almost destroyed the vineyards of France and other European countries in the last century. The only way in which it has been found possible to meet this pest is by planting vines of an American hardy species, on which later are grafted shoots of valuable varieties. The roots of the American species are able to resist the attacks of the *Phylloxera*, while the shoots from the graft produce the kind of grapes required by the vine-grower.

When the grapes are ripe they are picked from the vine, and dealt with afterwards according to the purposes for which they are grown. In all grape-growing countries large quantities of grapes are consumed as fruit, eaten fresh when they are ripe. Indeed, the more luscious varieties are grown almost entirely as a dessert fruit, and marketed in a fresh condition. For, although the grape has a thin skin, this is tough, and so grapes can be kept fresh for a considerable time, and can be transported to long distances in a ripe condition if carefully packed in cork-dust, saw-dust, or some similar material.

Besides their value as fresh fruit, grapes provide a valuable article of food when dried like the date and the

fig. Raisins are nothing more than dried grapes. Usually most European nations regard raisins only as ingredients in cakes and puddings, though they form a regular food in some of the countries of the East, where they are produced. The most highly valued raisins come from Spain, from the neighbourhood of Malaga and Valencia. These are dried and marketed in bunches, and are known as Malaga or "muscatel" raisins. The seedless raisins known as "sultanas" are chiefly the product of certain districts in Asia Minor and Greece. The little seedless dried grapes, of which the English name is currants, are almost exclusively grown in Greece and the Ionian Islands, and give rise to quite a large export trade. The English name is only a corruption of Corinth, that being the port from which they were first exported. Within recent years the vineyards of California, South Australia, and South Africa have been turned to account for the production of raisins; and this has led to the export of considerable quantities of this highly prized dried fruit from these countries. The grapes are dried almost universally in the sun.

Besides being used as an article of food, either fresh or dried, grapes have been employed from earliest historic times, in the countries where they are grown, in the manufacture of wine. Most of the grape harvests of the world are still used for that purpose. The kinds of wine are almost numberless; each vine-growing country, and indeed each vine-growing district, has its characteristic wines, differing from one another in colour, flavour, strength, and other points. The making of wine is, however, in every case essentially the same. The ripe grapes are pressed, so as to extract the juice, called "must" in its raw state, which is then allowed to

ferment for a time in vats. At the proper stage the fermentation is checked, and the juice allowed to settle. The clear juice is then run off from the sediment, or "lees", into casks, where it is allowed to mature before putting it into bottles. Some of the more expensive wines, such as the famous Champagne, undergo several other operations, and are kept maturing for a long time before they are thought fit for use.

Grape juice is also employed for the distilling of spirits, especially the purer kinds of brandy, which are made in France; while from the lees, and the skins and pulp left after pressing, a coarser kind of spirit is distilled.

The best kind of vinegar is also made from grape juice by allowing the fermentation to continue unchecked in it.

XXIV.—ORANGES AND LEMONS

The group of fruits which are known as the Citrus family belongs to the tropics, or to the warmer portions of the temperate zone. It includes the citron, lemon, lime, grape-fruit, pomelo or shaddock, and, best known of all, the various kinds of orange, bitter and sweet. These fruits may be compared with the apples, pears, and plums of the colder regions, but they are much more valuable, because they are more widely cultivated and more extensively used, not only as articles of food, but for various manufacturing purposes.

The growth of oranges, lemons, and limes in the tropics is not only to supply local needs, but for export to temperate regions, where the demand for them is an established one. Until recently the northern countries of



Loading Oranges, Florida

Europe obtained their supplies of oranges and lemons from the warmer temperate countries in the south of Europe, and from the islands in the Mediterranean, such as Sicily and Malta, and the islands in the Atlantic, like Madeira. In these days, however, the quick transport by steamships has made the importation of such fruit from longer distances easy; and so the orange and lemon groves of Florida and California have become a source of great profit to their cultivators.

The various cultivated kinds of the Citrus group seem all to have taken their rise in the south of Asia, some in India, some in Malaysia, some in southern China, and to have become known to European nations at different times. All the cultivated members in this group of plants are small trees, with leaves which, when crushed, are more or less fragrant. They bear small bunches of white or pinkish flowers which have a strong perfume, and yellow or orange-coloured fruit, in which a juicy pulp is surrounded by a leathery fragrant rind.

The true citron seems to have been the first of them known to Europeans. Its original home was probably on the southern slopes of the Himalayas, and thence it reached Greece and Italy through Persia and Media. It was known to the Greek and Latin writers as the "Medic apple", and was valued, as it still is, for the fragrance of its thick rind.

The next importation of this class of fruits into Europe during the Middle Ages appears to have been the lemon. This is considered to be perhaps only a variety of the citron, with a thinner rind and much more abundant acid juice. It seems to have been a great favourite with the Arabs for the sake of the refreshing properties of its cool, acid juice; and they introduced it, after their

conquests, into Spain and Sicily. The cultivation of the lemon in Sicily has grown to be one of its chief industries, not only for the exportation of the fruit in its fresh condition, but also because of the great demand in modern times for citric acid, of which the juice of the



Lemon—foliage, flowers, and fruits

lemon contains a large proportion, and which is largely used in the process of dyeing cotton cloth, as well as for other chemical purposes. From the rind of the lemon there is extracted the fragrant essential oil very much employed in the manufacture of perfumes, and for flavouring foods and drinks. The juice of the fresh

lemon is still most highly esteemed, as it was by the mediæval Arabs, for the preparation of the refreshing drink, lemonade, and as a flavouring of many kinds of food and confectionery.

For these purposes, however, the lemon is equalled, if



Lime—foliage, flowers, and fruits

not even excelled, by the lime, the species of cultivated *Citrus* which has been the last to be brought to the knowledge of European nations. The lime is the smallest fruit of these cultivated kinds of *Citrus*, seldom reaching the size of a large egg, and mostly much smaller. Like the lemon it is found growing wild on the southern

slopes of the Himalayas, but it had not been cultivated anywhere to any extent till the middle of the last century. About that time, when the demand for citric acid grew great, it was found that the juice of the lime contained an even larger proportion of it than that of the lemon. At the same time also the use of lime juice by sailors on long voyages was found to be an absolute preventive of a disease, scurvy, caused by continuing to live on salted provisions. It was found that the lime tree was especially suited to the conditions of some of the West Indian Islands. Its cultivation on a commercial scale was begun first in the small island of Montserrat, and then in the larger island of Dominica. The lime was cultivated in these islands to supply raw juice for dietetic use, and also for boiling down into a concentrated form as a source of citric acid. This cultivation of the lime in the West Indies is widely extending, and lime juice competes with Sicilian lemon products in the world's markets.

Lastly, we come to the members of this Citrus family which are chiefly known and valued as fruit. First, there are the oranges proper, bitter or sweet. The bitter orange, known very often as the Seville orange, was introduced into Spain along with the lemon, and cultivated for the same reasons, although the bitter flavour of its acid juice never allowed it to find general favour. Its principal use is in the preparation of the well-known preserve, orange marmalade. Its original home seems to have been southern China.

Until the voyages of the Portuguese to China in the 16th century the real sweet orange, which is probably an improved cultivated variety of the bitter stock, was unknown outside of south-eastern China. The Portu-

guese thought highly, as they well might, of the juicy, fragrant fruit, and soon introduced it into their native country. Because of the country of its origin, and of the first European country where it was cultivated, it is known often as the China or Portugal orange. From Portugal it has been taken into almost every part of the warmer regions of the earth, and provides the most universally esteemed fresh fruit in the world. By cultivation, hybridization, and selection, numerous varieties of established types are now grown. Orange-growers, in order to be able to guarantee the variety they cultivate, resort, as do the growers of other highly developed fruits, to the practice of grafting superior varieties on to stocks of inferior value, or even on to stocks of bitter oranges or lemons.

A still more recently introduced, and highly esteemed, orange is also a native of China. This is known as the Mandarin, or Tangerine, orange. Its rind is very thin and easily removed; thus it does not bear transport as well as thicker-skinned varieties.

The last species to be mentioned is the giant shaddock or pomelo, with its smaller and juicier variety, the grape-fruit. This is a native of the Malaysian Islands, cultivated in China, and brought thence to England by a Captain Shaddock about the end of the 18th century; hence one of its names. Pomelo is a word of which the origin and history are doubtful, but it seems related to the word *pomum*, an apple. The grape-fruit, so called from the flavour of its pulp, is a smaller, juicier, cultivated variety of the original pomelo, and is much more esteemed as a fruit.

XXV.—BANANAS

When Columbus discovered the West Indies, the banana, the fruit that is now the most largely grown and eaten in that part of the world, was not known there. At the beginning of the 16th century it was cultivated on the Canary Islands, having been introduced by the Portuguese as one of their spoils of the East. From the Canaries it was carried to Santo Domingo and to Brazil, to spread in a short time all over tropical America, and to provide a readily grown crop of nutritious and palatable food for the inhabitants of those regions.

As we have seen to be the case with other valuable fruits, the original home of the banana in its wild state is tropical south-east Asia and the islands of the Malay Archipelago. The fruit was well known to the early Aryan conquerors of India, for it is frequently mentioned in Sanskrit writings. Pliny, the Latin naturalist, who wrote in the 1st century of the Christian era, gives a good description of the plant, and says that the soldiers of Alexander the Great's armies had noticed it in his Indian expedition. It does not seem to have been cultivated in the Western world, even in Egypt, where it is now largely grown, until a much later date. The cultivation in India, Burma, and the East Indian Islands must date back, it would seem, to the very earliest ages. The extreme antiquity of the banana as a cultivated fruit is shown by the fact that no variety at present cultivated bears seeds. Continuous selection has produced dozens of varieties, differing in many respects from one another, but all agreeing in producing fruits containing



Banana Plantation, Fiji

an abundance of pleasant-tasting, nutritious pulp without any seeds. This result could only have been attained by centuries of careful attention and cultivation. The banana can only be propagated to-day, as it could only have been propagated from the first dawn of history, by means of "suckers" or offshoots from the parent underground stem or tuber. These, however, are easily obtained, and readily transported from place to place, so that nowadays, all round the world, in every part of the tropics, the banana is one of the commonest, as well as one of the most valued, fruit productions.

Apart from its economic value, the banana is a strikingly handsome plant. It is such a common object in the tropics that its beauty is perhaps overlooked. Anyone, however, seeing a banana plant in good condition for the first time cannot fail to be impressed by its appearance. Its crown of large shining-green leaves, each of which spreads into a blade from 10 to 12 feet in length and 18 to 24 inches in breadth, seems to spring from a slender palm-like stem ranging, according to the kind of banana, from 5 to 20 feet in height. From the centre of the crown of leaves the flower-stalk is produced, which curves downward, and from which spring the flowers, arranged in rows, protected by large, reddish-purple bracts, or sheaths. These rows of flowers ripen one after another, when the bracts fall off; and by degrees the upper rows develop from the green immature ovaries into the well-known fruit, usually yellow in colour, but red in some varieties. What looks like the stem of the banana, supporting the leaves and the huge bunch of fruit, is not a true stem at all, but is a cylinder composed of concentric layers of the leaf-stalks, the outermost being the stalk of the oldest leaf, forming a

special protection of the younger leaves and the flowering stalk, which rises from their centre. The true stem is a thickened "rhizome" or tuber, which gives rise to roots and "suckers" which are the developed leaf-buds of the rhizome. When the fruit has matured, and has been plucked, or has fallen off, the life of that particular



The Banana—foliage and fruit

stalk is finished, and if left alone it would wither away. The practice in cultivation, however, is to cut it down soon after the bunch of fruit has been removed; then a younger sucker is allowed to develop in its place, to bear in its turn a bunch of fruit.

The most striking features about the banana plant are

its rapid growth and the great amount of food it produces in proportion to the ground it occupies. It is calculated that an acre of bananas on suitable land, and properly cared for, will produce 242,000 pounds of food, as compared with 4000 pounds of potatoes, or 2000 pounds of wheat on the same area. It is no wonder, therefore, that uncivilized man looks upon the banana as a chief source of food; it has long been so regarded in the interior of Africa, and in the Pacific Islands, and it has become so to the inhabitants of the most out-of-the-way parts of South and Central America.

As was noticed before, there are dozens of different kinds of bananas cultivated in various parts of the tropics. These all, however, are supposed to have sprung from two or three species. The most noticeable difference is that some varieties, like the plantains, produce fruits which are only fit for use when cooked, either ripe or in a green condition. The true bananas, however, are valued for the deliciousness of their ripe fruit when eaten raw, though, on the other hand, these too are used cooked in many ways, or dried like dates, or still further dried and reduced to a flour which forms a nutritious and palatable food-stuff.

The banana is essentially a tropic plant, only fruiting well in hot regions plentifully supplied with water. In the last fifty years, owing to the great improvement in steamship transport, a huge trade in bananas has sprung up with Europe and North America. Up to the last quarter of the 19th century bananas were rarely to be seen in the fruit markets of Europe or North America. Now from the West Indies, notably Jamaica, from Central America, and from the Canary Islands, millions of bunches are shipped annually to these markets

in specially equipped steamships, and the banana is a cheap and highly esteemed fruit, eaten freely by all classes. The bananas exported are almost entirely of two varieties, the Canary or dwarf banana, and the Jamaican or Gros Michel. The variety chiefly exported from the Canary Islands to the markets of Europe grows on a short plant seldom more than 6 feet in height. The fruit is much esteemed for its delicate sweet flavour, but, as its skin is somewhat tender, it requires to be carefully packed for transport to avoid being spoiled. The bananas chiefly exported from Jamaica and Central America, in shiploads of thousands of bunches, are the product of a much taller plant, 15 to 20 feet in height. They have a tougher skin, and are much larger than the Canary variety; and though they are not of such a delicate flavour, they are held in great favour, because they keep so well, and are not liable to be easily damaged.

The banana-fruit industry has become a very large business indeed. It gives work and wages to thousands of people who are employed in cultivating and shipping the fruits, and in the fleets of steamers that convey them from the tropic lands where they are grown to the markets of the temperate countries where they find appreciative consumers.

XXVI.—POTATOES AND TOMATOES

The benefits that resulted to the world in general from the voyages and discoveries of the early explorers have been quite other than those which these adventurers actually sought to secure. To find wealth of gold and silver and precious stones was the lure that led them on their pioneer voyages. But it is through the diffusion of useful products from one country to another, products the cultivation and production of which have become sources of wealth to the industrious inhabitants of many lands, that the real enrichment of the world has come, enrichment of much more real importance than any increase in the quantity of gold and silver.

Some of these products were brought to Europe very soon after the discovery of America. They were looked upon at first only as rare and curious plants, to be cultivated with care. It was some time before their food value was recognized, and their cultivation extended till they became essential to modern agricultural prosperity.

The value of vegetables to mankind is of the highest. Human beings could exist healthily, especially in warm countries, without the use of animal food, but they could not continue to live without vegetables. Thus it is that vegetables, which supply nutritious food, have been taken from their original homes all over the world, and have been greatly improved by cultivation, so that they now yield better food and more of it.

Among the most widely spread introductions from America, which now contribute largely to the world's food-supply, is the potato. This plant belongs to a natural order, the Nightshades, many of the individuals of which are poisonous. Two other members of the

same family are cultivated for their nutritious fruits: the tomato, which, like the potato, is a native of America, and the aubergine, or egg-fruit, a native of India.

The potato—not the sweet potato, which is quite another plant—is a native of Peru, and was taken to Europe by the Spaniards about the middle of the 16th century. Its cultivation, on a small scale, spread from Spain to Italy, and later on to Germany. At first it does not seem to have been much thought of as a vegetable, probably because of wrong methods of cooking. Perhaps the potato was introduced into England independently. At any rate, old botanists used to state that the potato was brought first to England by Sir Walter Raleigh from Virginia in 1586.

The value of the potato as a source of food-supply was recognized fairly soon by scientific men in England, for in 1663 the Royal Society advised that, owing to the failure of the grain crops in Ireland, potatoes should be planted as a substitute to prevent a famine. It was not, however, before the beginning of the next century that potatoes were cultivated to any great extent in Great Britain or on the continent of Europe. Now, however, the world's crop of potatoes has grown to many millions of tons, and no other root is so widely used as an article of food. The potato is cultivated from Iceland to New Zealand, from China round the world, especially in the temperate zone, although it will yield a good crop in the cooler tropics also. Because it has the quality of keeping sound, when stored in a dry place, it is largely exported from the countries where it is grown all over the world.

The part of the plant which is used for food is often called a root: it is in reality a thickened underground stem, properly called a tuber. Each plant produces

several of these tubers, which are filled with starchy material, giving them their value as food.

Unlike the potato, its kindred plants, the tomato and the aubergine, are grown not for their starchy tubers, but for their succulent and nutritious fruits. These, however, are almost entirely used as vegetables, after having been cooked.

There may be to-day many comparatively unknown or little-appreciated vegetable products, which may become in the future what the potato and the tomato have become, great sources of food for the world, and of wealth to industrious agriculturists.



The Potato

XXVII.—MAIZE

From the very beginning of civilization the cereals, as those plants which produce the various kinds of corn are called, have supplied men with most of their food. Among the nations of the Mediterranean, wheat was cultivated, and looked upon as a special gift of the gods, while the more barbarous races of northern Europe depended largely on their crops of barley and rye. The peoples of southern and eastern Asia grew immense crops of rice as their chief food-supply, while the almost entirely savage tribes of Africa possessed, in many kinds of millet or sorghum, the corn which provided them with their meal. During all those ages, unknown to the Eastern peoples, there was cultivated by the American tribes, from the sources of the Mississippi to the mouth of the La Plata, and from Hayti on the Atlantic side to Peru on the Pacific, a cereal which took the place among them of the cereals of the East. As wheat was held in honour among the Greeks, as the special gift to men of the great Earth-mother, so was maize revered by the American tribes as the special gift to his children of the mighty Manitou, the Great Spirit.

Maize is the giant among cereals, as regards both the size of the ear and the size of each individual grain, and is scarcely inferior to any as a nutritious food both for man and for his domestic animals.

When Columbus on his first voyage discovered the large island of Hispaniola, he was struck by the fields of this giant corn, which the native Arawaks cultivated, and which they called by a name very slightly differing from maize, the most universal name of this grain. In North America it is usually spoken of as corn, because

it is the most widely grown cereal, just as for the same reason corn means wheat in England. In South Africa it is known as "mealies", a name derived from a Portuguese word meaning any kind of grain, from which also comes the English word millet, applied to quite a different kind of grain.

This American corn, maize, has spread in the last four centuries from its native home through all the tropic and warmer temperate regions of the earth. The world's crop of maize at the beginning of the 20th century is larger than the crop of any other cereal, and is the greatest agricultural source of wealth in the world. The early explorers and conquerors of the hitherto unknown lands of the East and West thought mistakenly that gold and gems were the most valuable results of their voyages. The wealth that has accrued, and still continues to accrue, to the people of the world by the cultivation of two plants only, the potato and the maize, discovered by those early Spanish voyagers, far exceeds that of all the gold and gems obtained by the spoiling of Mexico and Peru. Besides, the cultivation of these plants gives healthy occupation to thousands, and provides food for millions of human beings.

The story of the spread of maize cultivation begins with the growth of some grains brought from Hayti to Spain very early in the 16th century. Thence the cultivation soon spread into Italy and southern France, the Balkan countries and Hungary, and the countries on the northern coast of Africa. The Portuguese also soon introduced it from Brazil into their African colonies, west, south, and east. Later on it was introduced into India and the farther East. The native African tribes of the interior seem to have obtained grains of maize

from the coast tribes, so that the explorers of Africa in the last century have been astonished to find this American grain cultivated in portions of the interior never visited before by any stranger.

Maize is one of the most adaptable of crops, flourishing



Maize, showing Stem with Sheathing Leaves

as it does from the Equator to a little beyond the limit of the north temperate zones. It requires less care in its cultivation than almost any other cereal. These are probably the causes of its cultivation being taken up by peoples who have very little knowledge of, or who pay very little attention to agriculture.

Although maize will produce a crop with but little

care, no crop has had more scientific attention paid to it, especially in the United States, than has been bestowed upon this. Nor is this astonishing, when it is remembered that the value of the maize crop in the United States is greater than that of any two other crops of that country. The farmers there set an example to those of all other countries in their efforts to increase their crops of maize by careful farming, and by improvement of the product by means of selection, so that the best varieties of maize to-day produce far more grain to the acre than they did some years ago.

Another very large country, Argentina, in South America, has become the greatest exporter of maize in the world. Although there is not as much maize grown in Argentina as in the United States, more is exported, because there is not so much consumed at home. South Africa has also recently become a large grower and exporter of maize. Throughout the tropics and warm temperate zones the cultivation of this grain is being extended. The golden grains of maize coming from Argentina and South Africa circulate all over the world far more profitably than the metallic grains of gold taken by force from the natives of America by the old Spanish conquerors. But we must not forget that the world owes this circulation of useful grain to those brave men who proved that the ocean was the universal pathway between all the nations of the world, not the great divider.

The maize plant is a tall annual grass, growing from three to eight or more feet in height, according to the variety and the conditions. It has a stout, erect, jointed stem, which is solid, and which, when young, contains in its sap a considerable quantity of sugar. One of the

reasons for which the maize was so highly valued by the native tribes of America was that they expressed the sap from the young stems to obtain a much relished syrup.

XXVIII.—MAIZE (*Continued*)

The stem bears long, broad leaves, arranged alternately, the base of each one encircling one joint of the stem. From the top of the stem is produced a loose panicle—the “tassel”—of male flowers, which yield abundance of pollen, while the female flowers are arranged in a densely crowded spike—the “ear”—which is borne on a short branch springing from one of the knots of the stem. This “ear” is closely enveloped in leaf-sheaths, called, when taken together, the “husk”; from the point of the protecting sheaths of the husk protrude the long thread-like styles, called the “silk”. The grains of pollen are shaken from the stamens of the tassel, and blown about by the wind. Falling on the styles of the silk the pollen causes the fertilization of the ovules, and their development into grains. When the grains are ripe the husk turns pale-brown, and the whole plant withers.

Maize grows very rapidly, coming to maturity in from three to six months from the time of sowing. When the ears are ripe they are plucked from the stalks, stripped of the husk, and allowed to dry thoroughly. The grains are then separated from the receptacle on which they grow, which is called the “cob”, and the maize is then ready for the treatment which prepares it for food.

In dealing with any large quantity of the grain, or if it is desired to preserve it for any length of time, it is

advisable to submit it to a further drying process by artificial heat in kilns. The thoroughly dried grain is either exported as whole grains or is passed on to the mills to be crushed into flour of different grades of fineness.

It was found that maize flour was very apt to turn rancid if kept long. This was owing to an oil contained in the embryo of the grain. So nowadays, in large mills, the embryos are mechanically separated from the grains before the latter are crushed; the flour is then capable of being stored for a long time without going bad.

Considering the vast quantity of maize produced in the world, the question naturally arises as to the use made of all this grain. The principal uses of maize are, first, for human food, second, for the production of some form of alcoholic liquor, and third, as a food for animals. For this third purpose not only are the grains employed, either whole or crushed, but the whole plant. The stalks and leaves, and even the cobs, are a very valuable source of fodder.

As has been stated, maize was found to be a staple article of food among the native races of America when that continent was discovered in the 15th century; and we are told that the people had many ways of cooking it. It continued to provide the main supply of cereal food to the early European colonists; and up to the present day it is still one of the most important articles of diet of the American nations. In one form or another it is eaten by all classes of people. Maize is a highly nutritious and wholesome food-stuff, only excelled among the cereals by wheat. It has one disadvantage as compared with wheat: owing to the absence of the substance called gluten from the grains, unmixed maize flour cannot

be leavened so as to produce light spongy bread. For this purpose a large proportion of wheat flour has to be mixed with it. Nevertheless, there are prepared from it a great variety of articles of food.

The simplest and most widely spread manner of preparing maize flour as a food for human beings is boiling it with water into a stiff sort of porridge, known in different places under different names. For instance, this maize porridge is called by some African tribes "kous-kous", while in the United States it is called "mush", and in Italy "polenta". It is very quickly and easily prepared, and forms the principal daily food of multitudes of people. Mixed with wheat flour, maize flour is made into wholesome bread. It also forms the basis of very many kinds of cakes, biscuits, and puddings. When the grains are young and soft, especially those of the variety known as "sweet corn", they are cut from the cob and boiled, supplying a very delicious vegetable. Very excellent starch is also made in large quantities from maize, and this is also used in the preparation of articles of food, and for manufacturing purposes.

A large amount of maize is consumed in the production of alcoholic liquors. The Kafirs of South Africa brew an intoxicating drink from it of which they are very fond, which is known as "Kafir beer". In the United States much whisky is distilled from maize grain. A very wholesome and odourless oil is obtained from the embryos, which are separated from the grain before it is ground into meal.

Although the original American tribes obtained a syrup from the maize stalks, it is no longer found profitable to grow maize for the purpose of obtaining sugar from the stalks; but hundreds of thousands of tons of

syrup are made annually in America by converting the starch of the grain into glucose or grape sugar, and this is used largely in the preparation of sweetmeats, and in preserving fruits.

As a food-stuff for farm animals, maize is one of the most valuable. All farm animals, and poultry as well, are exceedingly fond of it, and for fattening purposes it cannot be surpassed. Even the cobs are of use for this purpose, for when crushed along with the grain they have a positive food-value for stock. As a green-fodder crop maize is often grown, and provides one of the best.

Lastly, the stalks, leaves, and husks are utilized very largely in the south of Europe and in the United States for the manufacture of paper. In fact, there is no part of this great grass that is not made use of for some purpose.

XXIX.—RICE

In the most densely populated countries of the tropical and sub-tropical parts of the world, rice is the "staff of life". The teeming millions of China, India, and Japan, that is to say, almost one-half of the whole population of the earth, use rice as their principal food.

The original home of rice was apparently in south-eastern Asia, where it may still be found growing wild. It seems to have been cultivated in that region from the very earliest times. Thence the cultivation was introduced into China about 3000 years B.C.; for we find that about the year 2800 B.C. the Chinese Emperor instituted an annual ceremonial sowing of five holy plants—rice,

millet, wheat, barley, and beans—the Emperor himself sowing the rice, while the four other plants might be sown by princes of his family. From India the cultivation of rice spread north-west into Persia, Mesopotamia, Syria, and Egypt. Probably the Greeks first became acquainted with the grain after the expeditions of Alexander the Great. The name of the cereal, which is very similar in all European languages, is formed from the Greek corruption of its Arabic name, which is itself probably derived from an old Persian word. In comparatively recent times the cultivation of rice has been carried on in the countries of southern Europe, particularly in the alluvial and easily irrigated plains of northern Italy, where rice is one of the principal crops.

Asia is the most important rice-growing division of the world. More than half of the rice that comes into the markets of the world is grown in India and Burma; for although China, Japan, Siam, Ceylon, and other Asiatic countries grow large quantities of rice, they hardly grow enough to supply the demands of their own population.

The annual flooding of the Nile valley provides a very favourable condition for rice cultivation. Accordingly rice is largely cultivated in Egypt. It is also widely grown along the coasts of East and West Africa, and in Madagascar.

In some parts of Australia attention is now being paid to rice as a profitable crop, and in some of the larger Pacific islands, such as Hawaii. It is said that rice grows wild in some parts of Queensland.

The cultivation of rice in America seems to have first begun by the sowing on a farm in Carolina of a small bag of grains, obtained from Madagascar in 1694. The

experiment was very successful, and Carolina rice obtained a special value on the market. Rice forms now an important crop in several of the south-eastern States of the American Union, owing to the possession by these of large tracts of land easily irrigated.

Still more recently rice cultivation has received special attention in British Guiana, and thousands of acres on the rich alluvial coast lands in that colony are now under rice, and rice has become one of the colony's most valuable agricultural interests.

Although there is a variety of rice known as "hill" rice, which is cultivated in some parts of Asia very much like any other grain crop, most of the grain is supplied by the "wet" rice, which has to be grown under such conditions that the land can be kept flooded for a great portion of the growing period. Hence the greatest centres of rice cultivation are the plains in the basins and deltas of great rivers, as in India, China, Egypt, Nigeria, the southern American States, northern Italy, and British Guiana. Here the water-supply can be kept up by means of irrigation works, sometimes on a huge scale, or from wells from which the water is drawn by the chain of buckets worked by hand or by animal labour.

The methods of watering the fields vary in different countries; but the object is the same everywhere; that is, the formation of fields to which water can be admitted, and on which it can be retained, at the will of the cultivator, so as to provide the rice plants with the conditions necessary for their proper growth.

Before the grains are sown, the fields, each surrounded by an earth-bank, are carefully ploughed and prepared. The seed is often sown broadcast, but frequently it is first sown in special beds into which water has been let



Planting Rice, Japan

till the earth feels and looks like fine mud. When the plants are 9 or 10 inches high they are transplanted in little groups into the fields, which have been flooded to the depth of a few inches. At first the water is let in and run off at intervals, but when the plants are established and growing well, the field is kept continually flooded. The water, however, is kept in a constant state of gentle circulation, being allowed to escape slowly from the lowest point of the field while more is let in from above. This prevents the stagnation of the water, which would kill the plants. As the rice grows, the whole field becomes covered with its green grass-like foliage.

Rice belongs, like the other cereals, to the great tribe of grasses, and when growing, it seems at first very much like wheat. Unlike wheat, however, the grains are not borne in a close ear or spike; but, like many other of the grasses, in a loose panicle.

When the crop of rice is beginning to ripen, which is shown by the alteration in colour of the plants, the water is drained off, and the field allowed gradually to dry until the rice is ripe.

When fully ripe the panicles, or "ears", with the stalks on which they grow, are cut, tied into bundles to dry, and then stored in barns to be used as required. The grains are removed from the stalks by some form of threshing, leaving the separate grains each covered by an outer brown husk. Rice in this form is called "paddy", and keeps in a better condition when stored thus than after the husk is removed.

The next step in preparing the rice for human food is to separate the husk from the kernel. This is effected either in the primitive way of pounding the paddy in

some form of mortar, and winnowing the chaff from the grain, or in the more scientific way of passing it under closely-set mill stones, and separating the grain from the chaff by mechanical blowers.

The grain is still surrounded by a very thin, brownish skin. To prepare it for Western markets the grain is passed through a machine which removes this skin, and, finally, the grain is polished by friction against cylinders covered with soft sheepskin. The product is then the almost snow-white rice most appreciated in the West.

This polishing is never done with rice to be eaten by the Eastern peoples, and it is a mistake; for, although the appearance of the grain is improved, its value as a food is much impaired, since the skin or rice-bran contains some very valuable elements which are necessary to the health of the human body. When rice is eaten as a grain it is far more nutritious as "brown" rice than as "white" rice.

Besides being used when cooked as whole grains, rice is ground into flour for food, although, like maize, owing to the absence of gluten in the grains, it cannot be made into leavened bread. A large quantity of inferior rice is also used for the production of starch for various purposes.

In Japan an alcoholic liquor is made by distillation from rice. This is known as "saké", and is highly appreciated by the Japanese. The Chinese also distil from rice a similar liquor.

Even the rice straw is utilized in Japan for many purposes, ranging from the making of paper to the construction of hats and even shoes.

XXX.—WHEAT

The cultivation of cereals dates back to the very earliest ages of human existence. These plants are called cereals from Ceres, the Roman name of the earth-goddess, whom the Greeks called Demeter, whose special gift to mankind was grain, whether wheat or barley does not matter.

We have seen that since the discovery of America the cultivation of maize, the great American cereal, has spread far and wide through the warmer portions of the Old World. In the case of wheat the reverse has taken place. Introduced from Europe into the temperate countries of America, wheat is now cultivated there on millions of acres, so that from Canada, the United States, and Argentina shiploads of wheat are continually exported to supply bread to the older nations of Europe, many of which no longer grow enough wheat for their own needs. Australia, India, South Africa, and other countries are also now wheat-growers.

Wheat can be grown on all sorts of soils, and almost everywhere in temperate regions. It does not flourish in extreme climates; therefore it can neither be cultivated in the tropics nor in the coldest parts of the world. The great question for farmers in temperate countries to consider is whether they can grow wheat profitably on their lands. In some countries the cultivation of wheat has been much decreased, because it can be imported cheaper than it can be grown.

From very early times some countries have been great exporters of wheat to others which would seem to be quite capable of growing their own supply, and this is still the case in modern times. As far back as the time

of Abraham we find from the Bible that the inhabitants of Palestine looked to Egypt for a supply of wheat to meet their needs, and up to the time of the breaking up of the Roman empire, Egypt and the northern countries of Africa were looked on as the granary of Italy and Greece. The great corn ships from Alexandria and Carthage brought to Rome most of the wheat that was used to supply her people with bread. When Athens, too, was at the highest point of her greatness, she obtained her wheat from the fertile fields of Sicily. During the Middle Ages, and in fact until the last century, owing to the difficulties of carriage, and to restrictive laws on the importation of grain from one country to another, most European nations grew each enough wheat for its own consumption. As populations increased the demand for wheat outgrew the supply, so that in many countries, as in Britain, the restrictive import duties were either abolished or reduced, while large cargo vessels, first under sail, and afterwards propelled by steam, were employed to carry the wheat from countries which grew more than they needed to countries where the supply was deficient.

Hence arose a great increase in the area under wheat cultivation in places where it could be carried on profitably. The great Russian and Siberian plains grow quantities of wheat, which is exported to other European countries. The more recently settled countries of the Western Hemisphere, however, have become the chief sources of the world's wheat-supply. The almost boundless prairies and plains of the north-western United States, and of the southern portion of Canada, and the pampas of central Argentina have proved to be thoroughly fitted for wheat-growing; so that in those countries the culti-

vation, harvesting, and exportation of wheat is carried on on a far larger scale than anything of the kind has ever been carried on before.

It has been thought that the many kinds of wheat grown at the present time have all sprung from one remote ancestor. This original wheat very probably was first found in the Mesopotamian plains. When it first began to be cultivated we have no means of discovering. Wheat, flour, and bread are all mentioned as well-known things in the very earliest writings of all the European and Asiatic peoples who have left any literature. Grains of wheat have been found in the dwellings of the prehistoric race called lake-dwellers, who built their houses on piles in the lakes of Switzerland, Hungary, and elsewhere, long before the coming into Europe of the races that inhabit it at present. Wheat has also been found in Egyptian tombs dating back, according to the authorities on Egyptian history, to 3300 B.C. From those remote ages to the present, wheat has been considered the most valuable of all the cereals, because from it can be manufactured real bread.

The many kinds of wheat cultivated to-day are a great improvement on the small-grained wheat found in the lake-dwellers' homes or in Egyptian tombs. Centuries of cultivation and selection of seed have produced plants yielding a much heavier crop. In recent years, too, more scientific selection and hybridization have produced still better varieties, enabling the farmer to grow wheat profitably, because for the same outlay he can obtain a larger return.

For wheat is an expensive crop to grow, especially on lands that have been cultivated for very many years. It not only needs very careful preparation of the soil

beforehand by ploughing, tilling, and weeding, but it also needs a plentiful supply of nitrogen, which is easily exhausted from a soil, and which has to be given back to it to obtain a good wheat crop.

When the land has been prepared, the farmer sows his wheat either in the autumn or in the spring, according to the kind of wheat he cultivates. This sowing is done either broadcast or by special machines which drop the seed on the ground with regularity. In a few days the plants spring up, covering the fields with a tender green. Wheat while growing looks not unlike many tall grasses. The ears are borne on stoutish stalks, and when ripe turn a beautiful golden yellow. The appearance of a field of ripe wheat in sunshine, when the wind bends the stalks, causing wave on wave to pass over it, and turning it into a succession of golden lights and shadows, is most beautiful.

In olden times, as is still done on small farms, the wheat was reaped by hand with a sickle or a scythe. But on the large farms the reaping is now done by machines drawn by horses or engines. The reaped wheat is bound into sheaves, and afterwards these are built into stacks. Next the grain is threshed from the ears either by flails or, on large farms, by machines. Winnowing, or separating the chaff from the grain, has next to be done. In olden times this was done by throwing up the grain for the wind to blow the chaff away; now it is usually done by threshing-machines, which sift the chaff from the grain by means of fans.

The grain is then ready to be sent to the mill to be ground into flour for making bread, or to be used, as much of it is, in the production of alcohol, or to be converted into starch.

The stalk of the wheat, called the straw, is extensively used for making many articles, because it is one of the strongest of straws. The well-known Leghorn hats, for instance, are made in Italy from wheat straw.

XXXI.—BREAD

To be of value for human food the grains of wheat must be ground into flour. In very early times this was done by pounding the grain between stones. Two stones were used, the lower being somewhat hollowed out on its upper surface, while the grain was rubbed on it by the upper one, which was shaped more or less to fit the hollow. Such mills are still in use among some of the peoples of the East.

These primitive mills gradually developed into the large stone mills, which were practically universally used for grinding wheat in Europe and America until the latter half of the 19th century. The mills were driven either by the wind or by the more trustworthy motive power of running water. The use of windmills and water-mills meant that the miller could deal with considerable quantities of grain in a short time.

Whatever the power used to move it, the mill consists essentially of a pair of flat circular stones, about 4 feet in diameter, the lower of which is fixed while the upper one is made to revolve on it at a high rate of speed. The surface of the lower stone is grooved, so as to allow the flour to escape from between the stones. The grain to be ground is fed between the stones through a hole in the centre of the upper one. These stones are most

accurately made from a kind of hard stone, and are fitted most delicately just at the required distance from each other. By the revolving pressure of the upper stone on the lower the grains are gradually reduced to flour. There are several pairs of millstones in one mill, the distance between the stones of each pair differing, and the grinding is repeated through the several pairs in order to obtain the best and largest quantity of flour. The meal is sifted, or "bolted", as it comes from each pair of stones, so that the process of milling consists of a series of alternate grindings and siftings. The result is flour of different degrees of fineness, and bran or "offals". The coarse particles of the grain, after the first grinding, are called "middlings" or semolina, and are used for making macaroni and other wheat-paste products, or they may be ground again so as to produce flour.

These stone mills, turned by wind or water power, have been largely replaced in recent years by large factories where tons of corn are daily dealt with. In these the millstones are replaced by revolving steel rollers, and hand labour has been almost entirely superseded by mechanical appliances. Once the wheat has been delivered at the mill it is not again touched by hand until it goes away as flour and "offals".

It is carried along from one set of rollers to another, and through cleansing and sifting appliances, on belts, or in endless chains of buckets, with the result that a flour of almost absolute purity is obtained, from which the universally esteemed white bread can be made. In this process the germs are removed from the grains, unless what is called "wholemeal" is wanted.

Bread may be defined as the product of baking a

mixture of flour, water, and salt, which is made porous by the action of yeast.

To produce bread, the requisite weight of flour is placed in a trough or bowl, and the right proportion of salt thoroughly mixed with it. The proper amount of yeast is then mixed with water, and poured into a hollow in the mixed flour and salt. Enough water is added to convert all the flour into dough of the required consistency. The dough is then kneaded or worked so as to secure a thorough mixture of the ingredients; it is then left for a short time to enable the yeast to do its work.

Yeast is a microscopic plant which causes fermentation. The yeast cells, which are mixed with the flour, find themselves in a position admirably suited for their growth and multiplication. The water in the dough keeps them moist, and dissolves for their use the elements of the flour which they need. Thus active fermentation is set up in the dough, resulting in the formation of carbon dioxide gas. Being a gas, this carbon dioxide occupies a large space, and its formation, owing to the action of the yeast cells throughout the mass of the dough, causes the dough to increase greatly in volume, when it is said to "rise".

Wheat contains a large percentage of the substance called gluten, which is very sticky and elastic. The process of kneading causes the particles of gluten to absorb water and to stick together. Each yeast cell in the dough forms a centre for the production of carbon dioxide gas, which forms a little bubble of gas enclosed by a film of gluten. The expansion or rising of the dough is due to the formation in it of thousands of these small bubbles from which the gas cannot at once escape.

It is to the formation of these bubbles that the porous, spongy structure of wheaten bread is due. Since, too, the formation of the bubbles is the effect of the retention of the gas by the gluten films, it is impossible to manufacture light, spongy bread from the flour of the grains of cereals, such as maize and rice, which do not contain gluten.

When the proper time has elapsed for the rising of the dough, it is taken from the trough or vessel in which it was mixed, placed on a table previously dusted with dry flour to prevent the sticky dough adhering to it, and divided into portions to form loaves of the size desired. These are either moulded into shape or placed in baking-tins, and again allowed to stand for a time for the yeast again to grow and cause a rising of the dough. As soon as this has proceeded far enough the loaves are placed in the oven. Here the heat causes the bubbles of gas inside the loaf still further to expand, while at the same time the outside of the loaf is hardened and browned into crust. When the loaves have remained in the oven for the requisite time they are withdrawn and allowed to cool as quickly as possible. They are then ready for use as bread, which forms the most palatable, nourishing, and digestible food known to man.

XXXII.—TOBACCO

It is a curious fact that the use of an article which can only be considered a luxury should have become world-wide within the space of four centuries; but this is the case with regard to tobacco, which is now used all over the world, and cultivated in tropical regions wherever there is any civilization.

It seems true that tobacco was unknown to the inhabitants of the Old World before the discovery of America. The early voyagers recorded their surprise at seeing the natives both those of the West Indies and those of the mainland, inhaling the smoke of the leaves of the herb by means of an appliance which we now call a pipe, but which the Caribs called "tabaco". This word the Spaniards thought meant the name of the plant, and hence our use of it to-day in that sense. The plant was held in high esteem by the Caribs, and the smoking of its leaves was probably more of a religious rite than a habitual practice.

In the 16th century, when plants of tobacco had been grown in Spain and Portugal, Dr. Nicot, a French ambassador to the latter country, wrote a treatise in which he attributed the most marvellous medicinal virtues to the herb. This treatise of the learned doctor seems to have spread the fame of tobacco throughout Europe, and was the reason why the plant became known to botanists under the name *Nicotiana*. Englishmen may, however, probably claim to be the first Europeans to use tobacco for habitual smoking. Sir Walter Raleigh certainly smoked—whatever may be the truth of the story of the servant who tried to extinguish him with a pail of water—and he successfully grew tobacco on his Irish estate.

At any rate during the 17th century the use of tobacco increased enormously all over Europe, though it met with the strongest opposition from the highest quarters.

From Europe the custom of smoking and the cultivation of tobacco spread through Asia and Africa, and all the islands of the East.

Everyone in the tropics knows the tobacco plant, it is so universally grown. It belongs to the same order of plants as the potato and the tomato. The leaves, for the sake of which it is cultivated, are large and simple, those on the lower part of the stem being the largest, sometimes nearly 2 feet in length. The seeds, which are very minute, are borne in small capsules.

As with all other crops, much care is necessary to obtain the best results. The seeds, which are very small, are first sown in specially prepared beds. As soon as the plantlets are sufficiently large they are transplanted into the fields. When the plants have put out a sufficient number of leaves they are "topped", that is to say, the tops are cut off, so that the remaining leaves may be most fully developed. As soon as the leaves turn slightly yellowish they are stripped carefully from the stalk, and hung in loose bundles in an airy room until they become "wilted", that is, somewhat shrivelled and brown, without becoming dry and brittle. Fermentation, to which they are then subjected, results in imparting to the leaves the particular odour and flavour desired, which are absent from the green leaf or from one merely dried. This fermentation requires great care, for on it depends the value of the leaf.

When cured, the tobacco is sold to the manufacturers of cigars, pipe tobacco, and snuff.

The most highly-priced cigars are made from tobacco

grown in one particular district of Cuba. Other West Indian islands, especially Jamaica and Porto Rico, grow tobacco valued for the same purpose, and the tobacco grown in the large East Indian islands of Java, Sumatra, and Borneo is also much used for cigar making.

From America, especially from Virginia and Louisiana, comes the tobacco most used for pipe smoking, while from the countries round the Mediterranean—Turkey, Syria, and Egypt—comes the tobacco which is used in the manufacture of the most famous cigarettes.

The cultivation of tobacco, its manufacture, and distribution is one of the world's large interests, nor does it seem to be declining.



Tobacco Plant

XXXIII.—TEA

A very striking instance of the manner in which the use of the product of one part of the world has become almost universal among civilized nations, owing to facilities of intercourse, is shown in the history of tea. Until quite late in the 17th century tea was unknown to the Western world; it was only commonly used for the preparation of a beverage in China and Japan, and to a small extent in India. Nowadays it is the common drink of all classes of people almost everywhere; from Siberia to Australia, from Russia to Canada.

The reason of this popularity is probably because of the refreshing and slightly stimulating effect of a cup of tea, owing to the caffeine in the leaves, a substance like that contained in those other widely-used beverages, coffee and cocoa.

Tea is the young leaves of a species of camellia, still found wild in the hills of Assam. The Chinese seem to have introduced it into their own country many centuries before the Christian era, but to have employed an infusion of its leaves in medicine only, until about the 8th century after Christ. Its use as a beverage does not seem to have been really common in China and Japan, where it was brought from China, until about the 13th century. The cultivation and manufacture of tea was kept thereafter by the people of those two countries almost as a religious secret.

It is said that on its first introduction to England it was supposed by the ignorant that the proper way to prepare it was to boil it, throw away the water, and spread the stewed leaves on bread and butter. The right way was soon learned, however, and although it was not

known in England until the reign of Charles the Second, before the end of the 17th century it had ceased to be a rare drink.

Until the middle of the last century nearly all the tea



A Ceylon Tea Garden

to supply the increasing demand on the part of Western peoples came from China and Japan. Then the British in India, and the Dutch in Java, began to experiment with the cultivation of the shrub. Later on, in order to replace their destroyed coffee plantations, the planters of Ceylon began to grow tea also. The result has been that

now the greater portion of tea consumed in the world comes from India, Java, and Ceylon, even though there has been no diminution in its cultivation and production in China and Japan. Tea is also successfully grown in Natal, and, to a small extent, in some other tropical countries.

The care that is necessary in harvesting and manufacturing tea probably prevents it being cultivated in many places otherwise suitable for it. In its wild state the tea plant grows naturally into a small tree, but under cultivation it is kept down to the height of a shrub 3 or 4 feet high by very careful and exact pruning. This is to enable the tea-pickers to reach the tip of each shoot with their hands, and to encourage the plant to produce lateral shoots; for tea is the only harvest which consists of the very youngest leaves of a plant, together with the leaf-buds at the tip of the shoots.

During the season the tea-pickers go through the plantations picking off the ends of the shoots with the two, or at most four, youngest leaves. This is repeated as often perhaps as twenty times in the course of the season.

The young leaves are taken in baskets to the curing-houses, where, after having been partially dried, they are rolled, dried again, and rolled again, before they are sifted and sorted into grades and packed in air-proof chests for the market. This process requires care and skill, otherwise the flavour of the tea, and consequently its value, is much lessened.

For a long time it was thought that black and green teas were the products of different species of the plant. It is now known that the difference consists in subject-

ing the leaves to a process of fermentation after the first drying, if black tea is desired, and omitting the fermentation if green tea is to be produced.

The rolling of the leaves used to be done by hand, and the packing of them into chests by stamping on them with bare feet. This is still generally the method in China. In India and Ceylon these operations are now carried out by machinery, a much cleaner proceeding according to Western ideas.

XXXIV.—COFFEE

Another beverage, which, like tea, may be said to be used now throughout the world, is coffee; though, again like tea, it only came into use among European nations in the 17th century, having been brought from Arabia by the Portuguese and Dutch merchants.

The native country of the species which produces Arabian coffee is Abyssinia. From Abyssinia it was introduced into Arabia, where it was cultivated for the sake of its berries. These were first valued for their fleshy outer pulp, which was eaten fresh; or the berries were allowed to ferment, and thus produce a sort of wine. The word coffee is in fact derived from the Arabic word meaning wine.

That the seed when roasted and ground and having had boiling water poured over it produced a refreshing drink, does not seem to have been known to the Arabs until the 14th century. Then its use quickly spread through the Mohammedan world. Early in the 17th century coffee was introduced into Europe, and was soon very

highly thought of, so that by the end of the century coffee-drinking became common, and coffee-houses, where men were accustomed to meet in order to obtain the beverage, and to exchange the news of the day, were very popular resorts.

Up to the end of the 17th century all the coffee used in the world came probably from Arabia. To-day coffee may be found growing in almost all tropical countries, although only in a few is it of great commercial importance. The story of this spread of coffee round the world is an interesting one. In 1690 the Dutch in Java successfully grew plants from fresh coffee seed. From there a plant was taken to Amsterdam, and in 1712 a seedling from this was presented as a rare exotic to Louis the Fourteenth of France.

Later on, seedlings from this were sent to the French West Indian island of Martinique. The ship in which they were being carried ran short of water, so that everyone on board had to be put on an allowance; but the officer in charge of the plants gave up daily a large portion of his allowance in order to water his charges, and so brought them safely to Martinique, to lay the foundation of what was for many years a most important industry of the French West Indies. Meanwhile the Dutch began to cultivate coffee in Java, and the English in Jamaica; and in 1770 the Portuguese introduced it into Brazil. About 1825 coffee began to be cultivated in Ceylon and in India on a large scale. At the beginning of this century Brazil produced some three-quarters of the coffee consumed in the world.

Other countries of tropical America also produce coffee to some extent; but coffee-growing in the West Indies, except in Hayti and Jamaica, has ceased to be of great

importance. In Ceylon the coffee plantations were ruined in the latter half of the 19th century by the attacks of a parasitic fungus for which no adequate remedy was discovered. Thereupon the planters substituted tea for coffee, and not much coffee is now grown in Ceylon.



Branch of Coffee Tree—in full bearing

There are many other pests, insect and fungous, which attack the Arabian coffee plant. Other species of the same genus are now being cultivated in coffee-growing countries, as being hardier and more resistant to disease than the Arabian species. The one most commonly experimented with for this reason is the Liberian coffee,

which grows wild in the sea-coast countries of tropical West Africa.

The coffee plant belongs to a class of plants which yields many valuable remedies, such as quinine. The Arabian species of coffee grows into a tall shrub, from 12 to 18 feet in height, with bright-green leaves, and produces bunches of white fragrant flowers from the axils of the leaves. These are succeeded by berries, which turn red when ripe. The Liberian species grows much taller, sometimes up to 30 feet high, with much larger leaves and larger berries.

When the berries are ripe they are picked, or shaken off the plant and gathered. The berries enclose two seeds or "beans" usually surrounded by a sweet pulp. This pulp is removed either by drying the berries and then removing the dry pulp by a rubbing process, or by allowing them to soak in water until the pulp becomes softened, when it is removed by washing, and the beans dried. In either case the beans are still covered with a thin horny covering, known as the "parchment"; this is removed by passing them through a sort of rasping-machine, and winnowing the fragments of parchment away. The seeds still are covered with a delicate membrane, called the "silver skin", which is rubbed off them mechanically. The beans are then ready for roasting and grinding into powder, which by the addition of boiling water yields the delicious, fragrant, and refreshing drink called coffee

XXXV.—CACAO

The tree is often spoken of as “cocoa”. It is better, however, to restrict the use of the word cocoa to the manufactured article obtained from the seeds of the chocolate tree or *theobroma cacao*.

To avoid confusion of ideas it may be explained that *cacao* is the tree from which *cocoa* is obtained, the *coco*-palm on the other hand bears the well-known large nut, and *coca* is the Peruvian plant from the leaves of which the valuable drug, cocaine, is extracted.

The cacao is one of the valuable plants the use of which only became known to the rest of the world through the discovery of America. When the Spaniards conquered the Mexicans and Peruvians they found that the most highly prized drink among them was made by roasting and grinding to powder the seeds or beans of the cacao tree, and mixing this powder with water and spice. This drink was known among the Mexicans by a name from which the word chocolate is derived. So chocolate still properly means cocoa mixed with sweetening and flavouring substances.

It was not, however, until the middle of the 17th century that cocoa began to be generally used in Europe. Indeed, it was not until the cultivation of cacao had been spread by the Spaniards from Mexico into their other possessions in tropical America, Venezuela and the neighbouring countries, and the large islands of the West Indies, that it was produced in quantities sufficient to be exported. Its use throughout the world has grown greatly, and during the last century its cultivation has spread to Ceylon, Java, and parts of West Africa.

The cacao is a small tree, 10 to 20 feet high, with

large light-green leaves. Its flowers and pods are produced not from the smaller branches or twigs, but grow out of the main trunk of the tree and out of the larger branches. The small flowers appear in bunches of about a dozen, and are followed by the fruits, which grow into gourd-shaped pods eight or ten inches in length.



Cacao Plants (fourth year) and Shade Trees, Samoa

These are packed with almond-shaped seeds or beans, surrounded by a sweet pulp.

Cacao can only be grown successfully in hot countries, and only in some parts of those. It needs a rich, deep soil, and has to be protected from strong winds, and also sheltered to some extent from the powerful rays of the sun.

The plants are grown from seeds, which in most cacao-growing countries are reared at first in bamboo pots or in baskets until they are of sufficient size to be safely transplanted to their position in the field. In order to shade them some kind of large tree is planted at proper distances. "Cacao-mothers" these trees are called in some countries.

It takes about five years for a cacao tree to begin bearing. It then continues to produce fruit all the year round.

When ripe the pod, which is at first green, turns, according to the habit of each tree, either yellow or red. Each pod when ripe is picked from the tree carefully, so as not to break off the young pods and flowers growing near it. The pods are then collected and split open. This work is very often done by women, because it is not laborious. The pulp and beans are then scooped out of the pods and taken in baskets to a building which is sometimes called the "sweating-house".

The "sweating-house" is so called because in it the cacao beans have to undergo a process of "sweating" or fermentation. Here the beans are placed in boxes or bins, and are turned once or twice a day and mixed together for about three days. This causes the pulp to melt and drain away from the beans. This fermentation also causes some change to take place in the beans themselves, by which they lose to a great extent the bitter taste which they have when fresh.

The beans have then to be dried; and that is done very often by spreading them out on trays in thin layers, and placing these in the sun. The beans are sometimes more certainly and quickly dried by means of hot air, which is forced through them by a machine.

When the beans are thoroughly dry they are put into

bags or barrels and are shipped all over the world, for in this dry condition they can keep fresh and sound for a very long time.

XXXVI.—THE SUGAR-CANE

One of the most notable instances of the far-reaching results which have occurred through the opening up of the world by sea traffic is that of the cultivation of the sugar-cane and the manufacture of sugar.

People are so accustomed nowadays to the universal use of sugar that it is generally looked upon, and rightly, as a necessary article of food. No longer back, however, than the 15th century, sugar was an expensive luxury in Europe, only to be obtained in small quantities from the East. If we go back to the centuries before the Christian era, we find mention of a reed in India which produced honey without bees. Otherwise sugar seems to have been unknown to the Greeks and Romans. The first account of sugar or sugar-cane in books which have come down to us is in one of the old Sanskrit books of India; and the word "sugar" is derived from the Sanskrit word, meaning sugar-cane, while the word "candy" is derived from a word of the same language, meaning sugar, so that "sugar-candy" is Sanskrit for cane-sugar.

Although the sugar-cane does not grow wild anywhere now, it is probable that it is a native of tropical south-eastern Asia. Cultivated first of all in India, it was carried thence eastwards to China, and later on by Arab traders westwards to the countries around the Mediterranean. In the time of the Crusades, Syria, Egypt,

Sicily, and Spain produced most of the sugar that found its way as a delicacy to the countries of northern Europe.

After the discoveries of the 15th century the Spaniards introduced the cultivation of the sugar-cane into their Atlantic islands, the Azores, Canaries, and Madeira. From Madeira it was carried to Brazil, and about the beginning of the 17th century its cultivation was taken up in the West Indies. From the West Indies the sugar-cane has been taken all over tropical America, and across the Pacific to such groups of islands as Hawaii and Fiji, where it now forms one of the main crops, and as far as to tropical Australia, thus circling the world; for the sugar-cane industry of Java and the Indo-Australian group of islands is one of the most important.

Owing to the widespread cultivation of the sugar-cane throughout the tropics, almost every tropical dweller knows what the plant looks like. It is really a giant grass with a stem of about $1\frac{1}{2}$ inches in diameter, and sometimes 15 or 18 feet in length, ending in a flowerstalk 3 or 4 feet long. Unlike many of the larger grasses its stem is not hollow, but is a close-packed mass of fibrous material, which contains the sweet juice or sap from which sugar is made. The sugar-cane takes about twelve or fifteen months from the time of planting to reach a condition when the juice contains most sugar.

For the purposes of making sugar, the cane, as a crop, is always planted by cuttings, either by cutting the stem into pieces and inserting them at regular intervals into the soil, or by laying whole stems in trenches in the field and covering them over with soil. In either case, growth takes place from the buds, or "eyes", situated at each joint or node of the stem.

When the canes are ripe the stems are cut near the

ground, the growing top, with leaves attached, is also cut off, and the canes are carried off to the sugar-mill,



Head of Sugar-cane Plant

a, Single flower. *b*, Part of bunch of flowers.

where the juice is extracted. Afterwards it is boiled down into sugar.

It was said above that for crop purposes the cane is

always planted by cuttings. This is not because the cane does not bear seed, but because the seeds are so minute, and take so very long to mature, that it would not be profitable to plant large areas with them. For a long time, indeed—in fact, until about fifty years ago—it was generally supposed that the sugar-cane was one of those plants which, owing to long-continued cultivation, had ceased to produce seeds. Recently, however, it has been proved that it bears seeds more or less freely, and new varieties have been raised, especially in the West Indies, from seedlings. This has given rise to the hope that, as with other cultivated plants, scientific breeding of the sugar-cane will result in a continuous improvement in the plant, giving varieties of greater hardiness, and with a greater amount of sugar in their juice.

XXXVII—SUGAR MANUFACTURE

When the early inhabitants of India first began to cultivate the sugar-cane it is probable that they only used it much as they used fruit, sucking the sweet juice out of the cane. One may say, perhaps, that the first cane-mill was nature's own invention, being the human teeth. This habit of sucking the stalks of the sugar-cane is still almost universal among the dwellers in tropical countries where sugar-cane is grown.

Before long, however, it must have been found out that the juice could be squeezed out of the canes. Probably at first this was done by pressing them between logs of wood. Then began the simplest form of the cane-mill, which can be traced from that very early

form up to the mighty multiple-roller steam-mill of to-day which crushes its hundreds of tons of cane daily, extracting from them almost all the juice they contain. Hand-power must have been succeeded by the use of cattle as agents for turning the mills, and this kind of mill is still used in parts of India. Then, when the use of water-power and of wind-power had been discovered, water-mills and windmills were used, making the crushing more thorough and the amount of canes which could be used much greater. Windmills for crushing the sugar-cane are still to be found in use in some West Indian islands, while in some places water-power is also still utilized for the same purpose. But the gigantic power of steam has almost everywhere taken the place of other motive power in cane-mills, so that all efficient mills nowadays are driven by steam.

When men first extracted the juice they must have found that if kept in that condition it very soon began to ferment and undergo changes. Perhaps the first sugar-maker was the sun. Some cane juice may have been left in a shallow vessel under the influence of the Indian sun, and the owner would have found that the juice had disappeared by evaporation, but that there remained a gritty substance which dissolved in the mouth and was as sweet as the original syrup, while it possessed the desirable quality of keeping good for a long time when stored in pots or other vessels.

So began, perhaps, the sugar manufacture. For this manufacture, however elaborate the appliances employed, is nothing more nor less than the evaporation of the watery portion of cane juice by the application of heat. The advance from natural evaporation by the sun's rays to artificial evaporation by means of fire was probably

soon made. Cane juice put into a pot and boiled long enough becomes a syrup which will keep for some time, but is still very liable to fermentation. In very early times the other great discovery in the manufacture of sugar must have been made, and that was, that by the addition of some alkali to the juice before boiling, its acidity was counteracted, and the impurities in the juice could be more readily skimmed off, with the effect that the syrup crystallized on cooling, thus giving real sugar, which could be stored for as long as they pleased. Perhaps the first alkali used was common wood ashes; but very long ago lime was employed for "tempering" the juice, and that is the agent now universally employed.

For many hundred years the cane juice, after tempering, was evaporated in a series of open pots or pans over a furnace; and, when the syrup had been evaporated to a certain consistency, it was poured into cooling receptacles where it crystallized. Then the cooled mass was placed in porous receptacles, from which the uncrystallizable liquid, known as molasses, might drain away, leaving the dry crystals behind.

As early as the 8th century, and probably long before that, it was the practice of the sugar-makers of the Mediterranean to reboil the crude sugar in order to further reduce the impurities. That was the beginning of the sugar refining, which gives us to-day the snow-white crystals that are the most valued form of sugar.

The evaporation of sugar-cane juice by means of open pans, or "taches", over furnaces is still the plan largely pursued in countries where sugar manufacture is in a backward condition, as in India and in some of the smaller West Indian islands. A great advance, however, was made in the efficiency and rapidity of evaporation

when the boiling was effected by means of steam; and a still further advance was made when the syrup was boiled by steam in closed vessels, called "vacuum pans", from which the air is exhausted by means of a vacuum pump.

To visit a modern sugar factory of large size, and fitted with the best appliances, is one of the most interesting experiences in tropical countries. Tramways bring in car-loads of canes, which are delivered on the moving platform, which passes them on in great bundles to be crushed between a series of ponderous iron rollers. The juice runs out into the receptacles, where it is strained of its coarse impurities, and the almost dry fibre, called "megass" or "begass", which comes out of the last pair of rollers is passed on to be burned in the furnaces which heat the boilers, thus providing the steam-power for the whole work.

The raw juice is mixed in vats called "clarifiers", with its proportion of lime, and gently heated there until the greater part of its impurities settles to the bottom or is skimmed off. From the clarifiers the juice passes through powerful filters which further cleanse it, and then it is passed through a series of three or more vacuum pans until the syrup becomes of the thickness needed for crystallization. As soon as the crystallized syrup is cool it is passed into wire baskets, called "centrifugals", which are whirled round at tremendous speed by an engine. This operation forces all the molasses through the meshes of the wire, and leaves the dry greyish-yellow crystals behind. These are well known as crystal sugar. From the centrifugals the crystals are scraped into jute bags, each of a certain weight, and then the sugar is ready to be shipped all over the world wherever there is a market for it.

XXXVIII.—OIL-PALMS

Palm trees of some kind or other are associated in the mind of almost everyone with the idea of the tropics; and rightly so, for, with few exceptions, none of the hundreds of species of palms, which give a distinctive feature to tropic scenery, will grow outside those regions. One of these exceptions is the date-palm, so long valued and cultivated in the warmer lands of the northern temperate zone. Two essentially tropical kinds of palm have in recent times, owing to the facilities of transport from the tropics, become of the greatest value to the civilized world for domestic and manufacturing purposes, although their value has been known from the earliest times to the uncivilized inhabitants of the lands in which they originally grew.

One of these is the coco-nut palm. This tall graceful palm, with its crown of huge pinnate leaves, seems to have had as its original home the islands of the Pacific and Indian Oceans. Thence it has been carried either by ocean currents or by human agency to almost all the countries of the tropics suitable to its growth. The early Spanish and Portuguese conquerors had a great deal to do with its introduction to the eastern coasts of tropical America, the West Indies, and western tropical Africa, to which shores no ocean current from the original homes of the coco-nut palm could bear its buoyant nuts, which are specially adapted by their tough covering to endure without injury long immersion in sea water.

When many of the islands of the Pacific were first discovered by Europeans, the coco-nut palm may be said to have furnished their primitive inhabitants with almost all the necessaries of life. The trunk supplied them

with logs for the construction of their houses, which they thatched with the leaves; the fibrous sheathes at the base of the leaves afforded them a kind of ready-made rough cloth for the scanty garments they needed; while from the leaves they wove baskets for various purposes.

The fruit, however, was of still more importance. Before it was fully ripe it supplied a delicious drink in the fluid which it contains, known sometimes as the milk of the coco-nut, and a palatable food in the nutty lining of its hard shell, which could be eaten raw. When quite dry that nutty portion was still valuable as food, while when grated and pressed it yielded an oil suitable for all their domestic purposes. The hard, woody shell was used to make drinking-cups, and for cutting into spoons and such like implements, while from the fibres of its outer covering or husk they twisted the twine or ropes they had use for. So that every part of the coco-nut palm was of value to those primitive tribes in the sunny islands of the Pacific.

In modern days the employment of oils of different kinds for various purposes has largely increased in connection with machinery, as food-stuffs, and in the manufacture of soap. The value of coco-nut oil, both as a lubricant and as a food-stuff, was recognized, not only by the Pacific islanders, but by the civilized races of India long ago. It has been, however, quite in recent times that the value of the coco-nut as the source of a large supply of oil for use in European and American manufactures has been taken advantage of, and its cultivation for that purpose undertaken in the tropics. At the present time there are vast plantations of coco-nut trees in almost every part of the tropics, cultivated almost entirely for the purpose of obtaining the ripe nuts in

order to extract the oil from them; and this cultivation is extending because of the increasing demand for the oil.

The coco-nut palm is best cultivated in loose, friable soil where there is enough water slowly draining away at no great distance below the surface. The palms are always grown from the nuts, which are usually allowed to sprout and send out the first three or four leaves in



Section of Coco-nut in its Fibrous Husk

a special nursery. They are then planted out, about 30 feet apart, so as to allow the spread of the huge leaves, and, if kept free from being choked by weeds, they will begin to bear fruit in suitable soil in about five or six years, and this they may continue to do for fifty or sixty years more.

The great nuts are sometimes picked from the tree by men climbing up the trunk,

but to get the oil the best way is to let the nuts drop off of themselves when fully ripe. The tree goes on producing nuts all the year round, and so the harvest is a continuous one.

When the nuts have fallen, or have been thrown down from the tree, they are collected, and the husk or fibrous covering is first removed. This is of value as the source of a stiff, strong fibre, known as "coir", from which mats, rough brushes, and cordage are made. The hard shell of the nut is then split open, and the nutty lining removed and subjected to the influence of the sun or of fire until it is sufficiently dry to keep sweet. This



Coco-nut Palms, Fiji

material contains the oil, and most of it is shipped to Europe and North America under the name of "copra".

In the oil factories the copra is grated, and the oil is extracted by pressure, leaving a residue which is being increasingly used as a fattening food for cattle and hogs. A large proportion of the oil thus obtained is used in the manufacture of vegetable butters, the value of which in cooking is being more and more recognized. The oil is also much used by soap manufacturers. In fact some of these manufacturers own large coco-nut plantations from which they get oil for their factories.

The grated nut is used before the oil is extracted, and after being dried, in the preparation of many delicious sweetmeats and confections.

The other tropical palm which has become of great economic value in modern days is the oil-palm of western tropical Africa. The nuts of this palm, which are borne in large clusters, are of about the size of a small egg. The rind of the nut encloses a pulpy outer portion containing much oil. This is obtained by mixing the pulp with water, and boiling the mixture until the oil rises to the top, when it is skimmed off. The kernel of the nut also contains a valuable oil, which is obtained by breaking the nuts and subjecting the kernels to pressure. These oils are now produced in great quantities, and are used for the same purposes as coco-nut oil. What is left of the pressed kernels is used, like what is left over of the coco-nut, as food for cattle and horses.

The production of nuts by the cultivation of the coco-nut and the oil-palms forms one of the largest industries of many tropic countries, and seems likely to attain still larger dimensions in the future as long as the ocean is the highway for such productions of the tropics.

XXXIX.—RUBBER

Dr. Chanca, the physician who accompanied Columbus on his second voyage, and to whose notes we owe many interesting particulars of the habits of the natives, and of the products of the New World, mentions that in Hispaniola children used in their games a bouncing ball made from the gum of a tree. This is the first notice that we have of rubber, a substance which it is not too much to say is nowadays indispensable to the domestic life, and to the manufacturing and engineering enterprises of the whole civilized world. For centuries this substance was only regarded as a natural curiosity, until it was found that use might be made of it to erase pencil marks from paper; hence the name it goes by in English, "india-rubber".

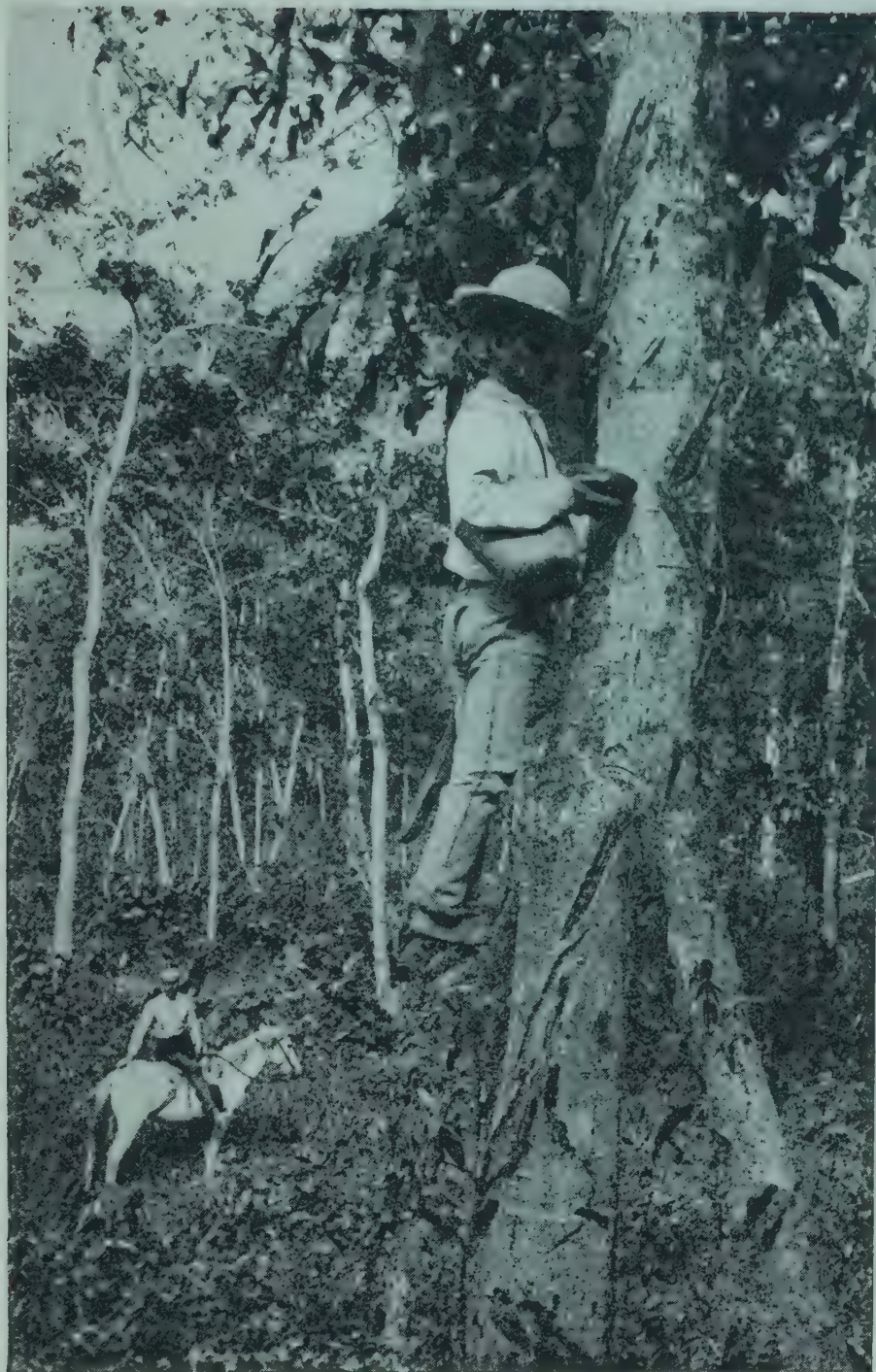
This use of rubber was discovered early in the 19th century, and some years after there was the further discovery that by treating cloth with rubber dissolved in naphtha the cloth is rendered waterproof. This was the beginning of the large waterproof industry, and caused, of course, a great demand for rubber. Soon afterwards the process known as vulcanizing was discovered. It is a way of combining rubber with sulphur, whereby the rubber can be made of any degree of hardness required. The result of this discovery has been to increase very greatly the uses to which rubber can be put. The invention of pneumatic rubber tyres, first for bicycles and then for motor-cars, has brought about in recent years a further very large use of rubber. The demand for rubber has now grown to vast dimensions.

Rubber is the coagulated milky juice, or *latex*, of many kinds of plants, trees, climbers, and shrubs, found

growing wild in very different regions of the tropics. The most highly prized rubber is the product of a tall Brazilian forest tree, *Hevea*. This is commercially known as "Para" rubber, Para being another name for the Amazon, on whose banks the forests grow. When, towards the end of the last century, the demand for rubber in Europe grew so great, the wild trees were ruthlessly cut down to obtain as large an amount of rubber as possible in the shortest time. It became apparent that the supply would soon be exhausted, although the world continued to want more and more. Attempts were successfully made to introduce this Brazilian tree into other countries suitable to its growth. Young plants in the first instance were carefully taken to Ceylon and Malaysia, and afterwards seeds were carried to many other tropical countries. The trees have been cultivated with success in some of these countries, and the production of "Para" rubber is now one of the great industries of Malaysia. This provides a further example of the wonderful ease of transport from one country to another in modern times.

Besides the Brazilian *Hevea* there is another important rubber-yielding plant found in Central America and the western side of South America, the *Castilloa*, a quick-growing tall tree, belonging to the nettle family. From the Arawak name of this tree the word "caoutchouc", as applied to rubber, is derived. Like the *Hevea*, the *Castilloa* has been carried to many other lands of the tropics and successfully cultivated.

The method of collecting the milky juice from the trees from which rubber is obtained is by making a series of diagonal or spiral cuts in the bark, extending some distance up the trunk; this is called "tapping". The juice exudes from the cut bark, and flows down



Underwood & Underwood

Collecting Rubber in a South American Plantation

the incisions into receptacles placed below them. Then, by the application of heat, the watery part is largely evaporated, and the thickened elastic part left is known as rubber.

Much rubber is also obtained from the forests of Equatorial Africa. This is the product chiefly of a tree, *Funtumia*, and of a very large creeper, *Landolphia*. These both belong to the same order of plants, *Apocynaceæ* or dog-banes, to which the handsome, flowering tree of the tropics, known as the Frangipani, belongs.

The rubber-producing tree native to the Asiatic tropics is known as the "India-rubber tree". It belongs like the *Castilloa* to the nettle family. In its young state it is valued as an ornamental plant for house decoration, on account of its large, glossy, green leaves, with their bright-red bud-sheaths. The rubber is best obtained from this tree also by tapping, as is the case with the rubber trees of the other tropical regions of the world. But owing to its heavy buttress roots it is difficult and expensive to tap, so it is gradually falling out of use as a source of rubber in favour of *Hevea*.

XL.—FABRICS

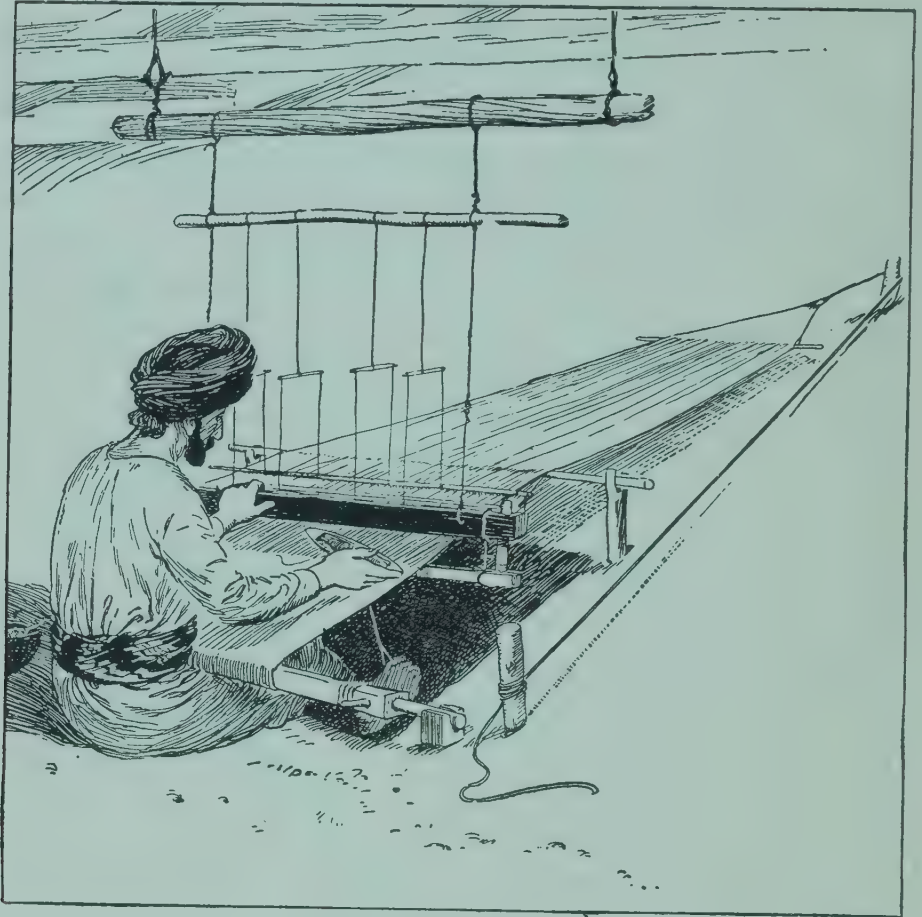
The nations of Europe were, until very recent times, dependent for their manufacture of cloth on flax and hemp and wool. The plants from which flax and hemp are obtained were apparently cultivated in Europe from the earliest ages, and wool was produced by the sheep, one of the first animals to be domesticated by man. But quite early in historical times fabrics made of silk and

cotton were known to the Greeks. These fabrics, particularly those of silk, were highly prized and very valuable. Originally silk was only obtainable from the East, especially from China, where the cultivation of the silkworm was practised some four thousand years ago. The secret of its value was kept in that country, it is said, until about the beginning of the 5th century of the Christian era, when some silkworm eggs were carried to her new home, at the risk of her life, by a Chinese princess, who was married to the chief of Khotan. From Khotan the culture of the silkworm seems to have spread quickly to India and Persia, and in the year A.D. 530 some monks from Central Asia managed to convey some silkworm eggs to the Emperor Justinian at Constantinople, and this was the beginning of the silk industry of southern Europe. Still the fabrics of silk and cotton from the East far excelled the products of European looms in delicacy, in richness of colouring, and in splendour of ornamentation.

Silk lends itself to the arts of the dyer and the embroiderer so perfectly that the patient Indian craftsmen produced robes and hangings of silk which were worth more than their weight in gold. In embroidery of silk, not only was gold and silver thread used freely, but in many instances precious stones were profusely sewn on to the fabrics to carry out some scheme of ornamentation.

In the hands of the Indian workmen cotton was woven into fabrics, some of them of almost transparent delicacy, like the muslins, the name of which is derived from Mossul, in Asiatic Turkey, long the centre of the trade in Indian muslins for Europe. These muslins were sometimes most delicately and artistically embroidered with gold and silver thread, or ornamented

with designs printed on them in colour. The art of printing designs in colour on cotton had been invented and used in India long before any such process was known in Europe. Not only did these cotton fabrics of



Indian Hand-loom

India appeal to the nations of Europe by their beauty, but many of them, like the calico, which takes its name from Calicut, were highly esteemed for their durability.

The carpets and hangings manufactured by Eastern

nations were also objects much sought after by wealthy people of the West. To this day, carpets made in the East cannot be surpassed in beauty of design or durability of texture.

The fabrics which came from India and China were therefore articles which formed a very profitable trade with the West; and, as was the case with the spices and perfumes, when the ocean route was opened, this trade grew; silks and cottons from the East became more and more used by Europeans, who, however, by improvements on the loom became, after a time, able to produce silk and cotton goods much more cheaply, and even of a better quality than the native Eastern workers. At last, instead of cloth, Europe began to draw from the East the raw silk and cotton to be used in her factories.

And yet the silks of India and China are still made and gorgeously embroidered, and the cotton manufacture of India, with its modern machinery, supplies a very large proportion of the cloth used almost universally for ordinary garments throughout the East. Although machinery is now largely employed in the cotton industry in India, yet the ancient process of hand-weaving is still pursued. In fact, for certain qualities and makes of cloth, which are either compounded in an intricate fashion or made in a very complicated pattern, the handloom seems to be specially suited, and is likely to survive long in India.

The most artistic of the cotton fabrics are the figured or flowered muslins, which may be called cotton brocades, the pattern being often formed, not only of cotton threads, but of silk or gold or silver, producing a very rich effect.

XLI.—DYES

The appreciation of bright colours seems to be natural to all races of mankind, whether civilized or savage. Everywhere, at every period of the world's history, men have found some substances from which they could extract bright colouring matters with which they could dye their clothing or paint their skins. These dyes were obtained in some cases from the animal world, but far the greater number from the vegetable world.

Of those which the animal world yielded one was most highly prized in ancient times. This was the celebrated "Tyrian dye", obtained from a marine mollusc which is still abundant on the coasts of the Levant. This animal secretes in special glands of its body a purple fluid, which the Tyrian craftsmen found could be used to give a very brilliant crimson or purple colour to various fabrics. For many centuries no dye was considered to be equal to this, and to wear a robe of Tyrian purple was almost synonymous with royalty. After the decay of Tyrian commerce, and the discovery of other red dyes just as brilliant, this industry ceased.

As was the case with so many other products, the opening up of the world brought into prominence dye-stuffs both from east and west. Soon after the Portuguese discovery of the sea road to India they began to import into Europe for the use of dyers a substance called "lac", which gave a red dye of superior quality, and also yielded a valuable resin for varnishes and similar purposes. Lac is produced by a tiny insect belonging to the class known as "scale-insects", many of which are destructive pests to plants. These lac insects live on the

juices of various trees and shrubs. They swarm in vast numbers on the twigs as soon as they are hatched out, and, attaching themselves there by means of the sucking apparatus of their mouths, they cover themselves with a resinous secretion, so that the twigs become almost entirely encrusted. This secretion is the lac from which the red dye and the varnish are obtained.

Until recently the lac insect was valued chiefly for its dye, but nowadays the resin is the valuable product, while the dye has ceased to be an article of export from India, and is only used locally.

The red dye which first successfully competed with lac is also got from an insect belonging also to the scale-insects. This is cochineal, which is produced by a scale-insect living on various species of the plant known as the prickly pear, belonging to the cactus family, natives of the American tropics. The cochineal insect, like the lac, lives on the juices of the plant it inhabits, and similarly swarms on the surfaces of the juicy leaf-like stems of the prickly pear. The source of the dye is not, however, any external secretion, but is the insect itself. When the cochineal insects are fully developed they are brushed off the plants and dried. The dried insects are then used to make one of the most brilliant red dyes.

For a long time after the discovery of the valuable dye to be obtained from the cochineal, the cultivation and production of the insect was a very lucrative employment in many parts of Mexico and Central America. Then the insect was introduced into other warm countries, along with the prickly pear, its only food. But the coal-tar dyes of the laboratory have almost entirely taken the place of cochineal, and the prickly pear has

become more or less of a pest in the countries into which it has been carried.

The dyes of the vegetable type still hold their own to some extent in the markets of the world, but even these are being driven out of use by the cheaper dyes discovered by modern chemists.

Though the brilliant red dyes spoken of are got from certain insects living on plants, and may be called animal dyes, most natural dyes are got from plants themselves, and so are called "vegetable dyes".

Some of these dye-producing plants have been cultivated from the earliest times for the sake of the dyes. One of them, called "woad", which grows wild in the temperate parts of Europe and Asia, was grown for its blue dye until the importation of indigo from India gave to the dyers of Europe a far superior blue.

The plants, from the leaves and stems of which indigo is got, have been cultivated in India from very ancient times. Before all natural dyes had been threatened with extinction by the modern manufacture of synthetic dyes the cultivation of indigo was very remunerative, and was widely extended, not only in India, but in Java, and in the West Indies.

The method of extracting indigo from the plants is interesting, because while they are growing no indigo is to be found in them. When the plants have attained the proper stage of growth they are cut down; they are then steeped and bruised in vats of water, where they undergo a process of fermentation, which causes the formation of the blue dye in the form of an insoluble powder. The water is drawn off, and the powder remaining at the bottom of the vat is dried, and made into cakes for the purposes of the dyer. Another plant which

was cultivated in Europe and in the East from early ages as the source of the red dye then most commonly used is the madder, from the root of which the colouring matter was extracted.

An ancient yellow dye, saffron, was obtained from the flowers of a kind of crocus. This dye is not very permanent; it is now used almost exclusively for colouring sweetmeats or other articles of food. Another yellow dye, used for similar purposes, is obtained from the covering of the seeds contained in the pods of the anatto, a native plant of the American tropics.

The natural dyes which at present seem to hold their own best against the synthetic ones are those derived from the heart-wood of certain tropical trees, especially logwood and fustic.

Logwood is the heart-wood of a tree found growing wild in Central America, and in some of the West Indies. The dye is used to prepare certain kinds of reds and blacks, and is still employed largely in dyeworks.

Fustic is also the heart-wood of a tree; it too is a native of the American tropics. This yields a yellow dye which is also still valued by modern dyers. The dye is obtained from both these woods by making an extract from the wood, which, for this purpose, is chipped up into very small pieces, and steeped in water.

It will have been noticed how the growth in commerce, which quickly followed the discoveries of the 15th and 16th centuries, enabled the nations of Europe to obtain many valuable dye-stuffs from the tropical regions of the world. The 19th century, however, saw these natural dyes become almost valueless. In 1856 an English chemist discovered that by the distillation of coal-tar a substance could be obtained which is

called "aniline", and that from aniline a series of beautiful dyes could be manufactured. Twelve years later another substance was produced, also from coal-tar, which is named "alizarin", from which also could be obtained dyes of brilliant hues. Further researches by men of science into the products of coal-tar have enabled the chemists to place at the disposal of the dyer almost any shade of dye required, at prices which have in many cases made the exportation of natural dyes from the tropics unremunerative. The production of these "synthetic" dyes, as they are called, has been so improved that they are manufactured to meet every requirement of the dyer, no matter what fabric he handles—wool, linen, cotton, or silk.

XLII.—COTTON

The cotton trade, if we count the trade in raw cotton, as well as in the manufactured goods, is one of the chief businesses in the modern world. The great variety of cotton articles in use, and the vast quantity of cotton grown in tropical lands have been made possible by the ease with which intercourse between different countries of the world can be carried on by ocean routes. The importance of cotton to-day in the agricultural, commercial, industrial, and social life of the world renders it hard to realize that until little more than two hundred years ago cotton fabrics were but little known to the nations of Europe, although the fibre had been used for centuries before the Christian era as a staple article in the manufacture of clothing by the people of India.

The nations of the Western world chiefly depended on

wool and on linen in earlier ages for the materials for the manufacture of clothing. Cotton has, however, in recent years taken the place of linen for general clothing purposes. It is also used instead of wool in many fabrics. The discovery that the treatment of cotton fibre with caustic soda gives it many of the properties of silk has caused cotton to be used in many cases in place of the more costly material. Cotton, therefore, has become of supreme importance to civilized mankind, because this one plant supplies material for making fabrics of such different textures, and applicable to so many different uses. Not only for peaceful purposes has cotton become indispensable, but the tremendously powerful explosives necessary in modern warfare need as their basis cotton fibre; no nation which cannot obtain a supply of cotton can long carry on war in these days.

To the uncivilized races of the tropics, with their simple needs, cotton is also most important, and all kinds of garments, ranging from the primitive loin-cloth to elaborately ornamented robes, are woven entirely from cotton.

Cotton was in common use in India long before the Christian era. The "wool-bearing" trees, and the fine white cloth made from the wool of it, were noticed by the soldiers of Alexander in the 4th century B.C.; and for many centuries afterwards the only cotton goods seen in Europe were the much-prized fabrics got from India.

The ancient Egyptians were not acquainted with cotton. Only after the Turkish conquest was the cultivation of cotton introduced into Egypt, though that country is now one of the world's greatest cotton-producers.

Columbus and the other early explorers of the New World found cotton growing in the West Indies, and in all the lands of tropical America. Its employment in the manufacture of cloth was also general; in fact, by the civilized Mexican races it was the fabric most used.

Still, until the 18th century it might be said that hardly any manufacture of cotton cloth was carried on except in India. It is even remarkable that in China, where the majority of the people are nowadays clothed in cotton, no cultivation of the plant, or manufacture of the cloth, was carried on before about the 13th century.

The 19th century, however, witnessed the marvellous development of the British cotton manufactures. Instead of importing cotton fabrics from the East, British manufacturers were sending all sorts of cotton goods all over the world, even to India itself. In fact, Great Britain became, and remained for many years, almost the sole supplier of cotton fabrics and cotton thread to the world.

This position was due to the fact that the British manufacturers took advantage not only of the improved facilities of transport, but of the great improvements invented in spinning and weaving machines, and of the better methods of bleaching, dyeing, and printing cottons.

The end of the 19th century has been remarkable for the rise of large cotton factories in many other countries in Europe, in North America, and in India, so that the export trade in these fabrics from the British mills now meets with serious rivalry from many quarters.

Cotton is a crop only suitable for warm climates; it is grown in almost all countries between 40° N. and 30° S. of the Equator. Although it is grown in so many different countries, most of the world's commercial supply of cotton comes from three places, the United States,



Cotton Picking (United States)

Underwood & Underwood

India, and Egypt, these three producing about four-fifths of the cotton in the markets of the world, the United States supplying more than half of the whole. Since the United States have become also a great manufacturer of cotton goods, there is not so much cotton for export from the States. British manufacturers have therefore of late years, in order to obtain a full supply, encouraged the extended cultivation of cotton in British colonies where it can be profitably grown. Thus cotton is now being largely cultivated in the British colonies of both East and West Africa, and in the West Indies, while the ancient cultivation of the plant in India and in Egypt is being extended and improved. At the same time other European nations with tropical colonies are also encouraging the cultivation of cotton in their dominions, so that the world may rely upon an adequate supply of this most necessary material.

Cotton, like the hollyhock of European gardens, and the hibiscus so well known in those of the tropics, belongs to the order of mallowworts. There are several species from which the fibre is obtained, some of them being very tall perennial shrubs; but the cultivated species chiefly consist of varieties which are planted annually, the chief difference between them being in the length of the fibre. Of these the cotton principally grown in the United States produces what is known as upland cotton, not possessing a very long fibre. Somewhat similar is the variety chiefly grown in India. Much of the Egyptian cotton possesses a longer fibre, and is therefore of more value. The most valuable cotton, however, is the Sea-island cotton. This is only grown in a limited district of the United States, and in some of the West Indian islands. It obtains

the best price on the market, being used by the spinners for special purposes, for which the short-fibred cottons are not suitable. According to the length of the fibre cotton is spoken of as short or long "staple".



A Sprig of Cotton showing Flowers and "Bolls"

In the cultivation of cotton, after the land has been well tilled, the seed is sown in holes 3 or 4 feet apart in rows from 3 to 5 feet from one another. While the

plants are growing they must be kept free from weeds. A sharp look-out must be kept for insect enemies, of which the cotton plant has many, and every means taken to check and destroy these pests. In five or six months the plants produce their showy flowers, which are followed by the pods or "bolls". As soon as these are ripe they burst, showing the white cotton fibres which are attached to the seeds.

The harvesting then begins, which is done by hand, principally by women and children, who go through the cotton-fields picking the "seed-cotton" from the bolls, and collecting it in baskets. This seed-cotton consists of the fibres or "lint" firmly attached to the seeds. After having been collected from the field it has to be treated so as to separate the seeds from the lint. This is done by passing it through a machine called a "gin", which is a contraction of the word engine. By the action of toothed rollers or disks on the seed-cotton, the lint is separated completely from the seeds. The lint is then made up into bales tightly pressed by hydraulic machinery into packages of uniform weight and size, which are then ready for shipment to the factories, each of which employs perhaps thousands of work-people, and turns out daily miles of cloth. The cotton-seed is also very valuable, for by pressure an oil is obtained which is palatable and nutritious, and is used for many domestic and manufacturing purposes, while the residue of the seed is employed, under the name of oil-cake, as a fattening food for animals.

The cultivation of cotton, therefore, is for many reasons likely to remain one of the principal resources of agriculture in the tropics.

XLIIL.—FIBRES

The employment of fibres obtained from plants for the purpose of making cloth, ropes, and matting would seem to have been one of the earliest industries of mankind. From the remains of the houses of the primitive lake-dwellers of Switzerland, it is evident that in Europe in prehistoric times flax was cultivated and used as a textile. Linen fabrics are found in ancient Egyptian monuments; and references to flax and linen occur frequently in the Bible and in all ancient European literatures. The most primitive races to-day, even if they do not employ fibres to make themselves clothes, still use them for making strings for their bows and fishing-lines, or plait them into nets and baskets.

The fibres used at the present day are derived from many different plants, and are as numerous almost as the uses to which they are put. Let us consider now some of the more important fibres derived from the stems of plants.

Flax was probably first grown in Western Asia. It is now extensively cultivated in many countries of Europe, as well as in India and China, and in North America. In the manufacture of cloth, flax is, next to cotton, the most important vegetable fibre in the world.

In the countries where flax is grown the seed is sown thickly in the field, and when the plants attain maturity they are pulled up, and piled in loose ricks to cure or dry. The seed is removed by threshing, and the "straw", as the stems are called, is placed in water for a time. This "retting"—another form of the word rotting—causes the softer portions of the vegetable tissue to decompose; and so allows the easy separation of the



Flax Plant

fibres, which are the harder portions of the "bast" or inner lining of the bark.

When the flax is sufficiently retted, it is again dried and subjected to what is called a breaking process. This is done nowadays by machinery, and consists in breaking the stems by passing them through rollers in order to be able to separate the bast-fibres from the inner wood of the stem; the wood being brittle is broken into fragments by the action of the rollers, while the flexible fibres pass out unhurt. Finally, the process known as "scutching" is performed. The broken stems are passed between revolving blades, which beat out all the woody fragments, leaving the fibres or flax. This, when quite clean and dry, is made up into bales for the market. Then the spinner and weaver manufacture it into many kinds of linen fabrics, for which it is rightly valued, as being the strongest

of vegetable fibres, and yet fine and soft.

There are several fibres known as "hemps", such as Manila hemp, sisal hemp, sunn hemp, which are obtained from very different plants; but the true hemp

is the bast fibre of a plant of the same family as the stinging nettle. Like flax, it has been cultivated for thousands of years, and is still very valuable. It is cultivated in the same countries as flax, but it is a larger and hardier plant. The process of obtaining the fibres is also similar to that employed for flax. Hemp is used for making coarse kinds of cloth, such as sail-cloth; it is also very extensively employed for making all kinds of cordage, from large ropes to fine twines.

These two plants, flax and hemp, were the chief source of fibres for the nations of Europe; and in fact were the only vegetable fibres employed by them for textile purposes, until they became acquainted with cotton and other fibres of the East after the discovery of the sea routes to India and America.

One of these tropical Eastern vegetable fibres recently used for manufacture in Europe is jute. Like flax and hemp, jute consists of the bast fibres of a plant. It is largely cultivated in India; the fibres are obtained and prepared in a very similar manner to those of hemp. Jute is very largely used in the manufacture of the



Jute Plant

coarse cloth from which the bags in which raw sugar and many other products are packed for shipment from place to place. It is also employed extensively for making cordage and twine.

In parts of the tropics other plants producing bast-fibres are cultivated, such as the sunn or India hemp, one of the Leguminosæ; another plant belonging, like the true hemp, to the nettle family, yields the ramie fibre; while several species of hibiscus yield fibres which are of value locally in very many parts of the tropics, but are not as yet of very great importance commercially in the world's general use of fibres.

There are other fibres, however, largely used, especially in the manufacture of cordage, obtained from the fibres of leaves, and these fibres are of great importance. This class of fibres has only been brought to the notice of European nations since the 15th-century discoveries, and it has only been in comparatively recent times that the manufacturers of cordage have made the great use of the fibres of leaves which they do at present.

If the leaf of a grass or of corn is held up to the light, it will easily be seen that the larger veins or fibres run continuously in almost parallel lines from the base to the tip of the leaf, which is said, therefore, to be "parallel-veined". All Monocotyledons are veined in this way.

Many of these plants growing in warm countries produce gigantic leaves several feet in length. The fibres of some of these are so fine and strong as to have been used from the earliest times by the natives as materials for making ropes and twine. Now they are sought for by the peoples of colder regions for the same purpose.

One of the earliest of these leaf-fibres to be so used

is known as Manila hemp, which is obtained from the leaf-sheaths of a banana grown in the Philippine



Manila Hemp

1, Flower. 2, Fruit.

Islands, though it does not bear edible fruit. The so-called stem of the banana really consists of the leaf-sheaths. In these the fibres are arranged in parallel lines from the base to where the blades of the leaves

begin. These fibres are very strong, and considering that the length of them is from 10 to 20 feet, it can readily be understood that they are of the greatest value in rope-making. Manila rope, as it is called from the capital of the Philippines, is in fact of the highest value. The fibres are got by cutting down the "stem" when the plant has flowered; splitting the sheaths into longitudinal strips; and submitting them to a process of scraping and washing. The strong, long fibres are thus separated from the softer tissues; they are then thoroughly dried, and packed in bales for shipment.

Another kind of plant, from the leaves of which valuable fibre is got, belongs to the same order as the Amaryllis of the tropics and the daffodils of Europe. The Agave, originally found in Central America, but now grown in many other parts of the tropics, is the most important plant of this class. It yields the fibre known as sisal hemp, which is used for cordage, and also in the manufacture of certain fabrics. This plant produces leaves of 4 or 5 feet in length and 6 to 10 inches broad, growing in a cluster round a short stem. When the leaves attain maturity they are cut off close to the stem, and subjected to a similar process to that to which the sheaths of the Manila hemp are subjected. These plants thrive in comparatively dry and rocky soils, and can often be profitably grown where no other crop would succeed. They yield a supply of leaves for several years, until they flower, when they die down, and have to be replanted. There are other plants related to the sisal hemp, though not so useful, which yield similar fibres.

Some tropical plants of the lily kind also yield fine, long fibres. The most important of these is the Phor-

mium, or New Zealand flax. The silky fibres of its leaves are being more and more utilized for making the same kind of fabrics as are made from the true flax. Another of these plants, the leaves of which give a good fibre, is, as to one or other of its species, a native of the tropics round the world. This fibre is known as "bow-string" hemp, and is fine and strong.

XLIV.—QUININE

Explorers and settlers in new lands have to face many dangers in low-lying swampy districts. The first settlers in tropical countries found that there was malarial fever all the year round. This disease saps the energy of the sufferers, even if it is not as deadly as some other diseases prevalent in hot countries.

The early Spanish settlers in tropical America suffered much from malaria. In the 16th century, however, the Jesuit missionaries began to make known the virtues of the bark of a tree found growing in the forests of the Andes of Peru. They used it as a cure and as a preventive of malarial fever. The recovery from a severe attack of fever of the Countess Chinchon, the wife of a Viceroy of Peru in 1638, after she had been treated with this bark, made it famous, and caused the tree to be called Chinchona, subsequently corrupted into Cinchona, though the bark was known long as Jesuits' or Peruvian bark. The active principle obtained from it is known as quinine, and on the quinine its curative properties depend.

The use of quinine as the most valuable medicine

against malaria became general all over the world. It must be remembered that the three or four kinds of *Cinchona* from which the bark is got only grow wild either singly or in small groups in a certain limited district in the Andes. The bark was got by cutting down the trees, and stripping them entirely of their bark.

The use of quinine had been so helpful in malaria that not being able to get it would be a great misfortune. In consequence, seeds and plants of the most useful kinds of *Cinchona* were got from Peru, and in the middle of the last century, Government plantations were established both in Ceylon and Java, as these countries promised to be well suited to its cultivation. Later on plantations were established in India, both in Madras and Bengal, so as to enable the people to get enough quinine at a trifling cost. The planters in Java, by careful selection of the best varieties, and by a better way in collecting the bark and extracting the drug, were able to obtain such an increase in yield that even lowered prices still proved remunerative. From Java comes to-day the greater part of the quinine in the world's markets. The Indian Government plantations produce great quantities of cinchona, but large as is their output it is all used in India itself.

No other drug has been discovered which can take the place of quinine as a preventive and curative medicine in cases of malarial fever. It is of the greatest importance in the tropics, therefore, that there should be a sufficient supply.

Instead of destroying the whole tree to obtain the bark, as was formerly the way, the trees now are either only partially barked, and so are enabled to renew their

bark after the operation, or they are carefully pol-larded.

The old way of using cinchona was by making an infusion of the bark. Now, however, chemists extract its essential principle, and the drug is chiefly used in the form of a powder, known as sulphate of quinine.

The fight against malarial fever, which so long depended upon the use of quinine, has recently been further helped by the discovery that malaria is caused by the multiplication in the blood of a special kind of microbe. These microbes are carried from one person to another by mosquitoes. So nowadays very many parts of the tropics, which used to be considered most deadly to Europeans to live in, have been rendered perfectly healthy by destroying the mosquitoes.

XLV.—TIMBER

From the time that men first began to build huts or make rafts, timber was of great use to them. As their requirements and their powers of using the wood grew, so did the value of timber. At first, men probably cut down only such trees as they needed for immediate use. When the need for land in which they might grow the grain, and roots, and fruit they needed was felt, they began to make clearances in the forests by felling large numbers of trees. Thus it would seem that the cutting down of the forest, which is going on nowadays with increased rapidity, probably began in very early times. The uses men make of timber, therefore, have continued to multiply, and the demand for it to increase, while the supply of it tends to become less.

In the case of the supply of timber for future needs men have been very short-sighted. They have taken care to replant and extend the cultivation of other vegetable products which they need, but until lately they have been content to cut down recklessly all the timber wanted for any purpose, without thinking of the future supply. It is a good thing that Forestry Departments in all parts of the world, notably in India, are now giving attention to this question, and discouraging the wholesale destruction of timber; while at the same time encouragement is being given to the replanting of tracts of land previously stripped of trees.

The increase in the exchange of products of different countries in modern days as compared with ancient times, which has been often noticed in these lessons, is very remarkable in the case of timber. Of course the transport of heavy timber over long distances, either by sea or land, must have presented almost insuperable difficulties to ancient peoples, with their small vessels and their inadequate means of haulage. Still, shipments of timber were made for considerable distances in very early times. For instance, as the Bible history tells, Hiram, King of Tyre, made large shipments of cedar for the building of King Solomon's temple at Jerusalem, floating the logs down as rafts from some Tyrian seaport to Joppa, whence they must have been hauled overland to Jerusalem. King Solomon also imported, in his ships from the east, still more valuable and rare woods for making furniture and musical instruments, though it may be doubtful from what trees those woods were obtained.

When the tropics were first opened to European colonization, the early settlers were content to use the various

timbers that they could obtain from the trees of the vast tropical forests. However, after large clearings had been made for the purposes of agriculture, their descendants have found it easier to import timber for house construction and common use from the forests of the temperate zone. Nowadays this sea-borne trade in timber is very large, and no distance is so great as to prevent it. Ships laden with thousands of tons of logs of pine take it from Vancouver round Cape Horn to Europe.

Most of the timber used in house-building is got from different kinds of pines or firs, which are nearly all natives of the temperate zones. Vast forests of some species or other of pines or firs exist in North America and northern Europe. The timber of these is shipped thence all over the world.

On the other hand, the most of the hard, and very handsomely marked woods, used in cabinet-making, come from various parts of the tropics. Of these the hard black wood called ebony was one of the earliest known; another of them is the largely used mahogany; and there are many others which the tropics exchange, so to speak, for the pine timbers of cooler regions. Some tropic trees are famous for the hardness of their timber, and its resistance to the action of water. The "green-heart" of British Guiana is a striking example of this. The wood is almost indestructible in water; and hence it is made use of more and more for piles, dock work, and such purposes.

XLVI.—SCIENTIFIC VOYAGES

Columbus and the explorers who followed him had opened to the trade and colonization of the European nations the hitherto unknown world of America and its islands; Vasco da Gama had shown the way to communicate with the ancient and civilized nations of the East, by sailing round Africa and across the Indian Ocean; and Magellan and later Drake had linked up these two discoveries by their voyages round the world. By the end of the 17th century the knowledge of the coasts, at least of Asia, Africa, and America, was fairly complete. At least it was complete except as far as the northern coasts and the northern part of the west coast of America were concerned. There remained, however, a vast expanse to the south of the East Indian Archipelago, and all over the Pacific, which was still quite unexplored.

It is true that many sailors of different nations, like the Dutchman Tasman, and the Englishman Dampier, had made venturesome voyages here and there over the Pacific; and had touched at some points of the Australian and New Zealand coasts. It was not, however, until after the middle of the 18th century that voyages, undertaken for the scientific purpose of obtaining accurate knowledge of that part of the world, revealed the position and extent of Australia, New Zealand, and most of the groups of islands in the Southern Pacific.

The first of these scientific voyages was made by the Frenchman, De Bougainville, who, starting from St. Malo, in Brittany, in 1765, sailed round Cape Horn, and after discovering and naming many groups of islands in the Southern Pacific, as for instance Tahiti and Samoa, he passed through the East Indian Archi-

pelago, across the Indian Ocean, round the Cape of Good Hope, back to the port from which he sailed, having lost only seven of his crew of two hundred men in this remarkable journey round the world, which had lasted more than three years.

Still, most of the largest and most important of the Pacific islands remained practically unknown. Besides, the questions whether New Guinea was connected or not with the northern coast of Australia, what was the size of Australia, and whether there existed another vast continent occupying much of the area of the south Pacific still remained undecided. The blanks in the maps were more or less accurately filled up, and the disputed questions solved by the English sailor, Captain James Cook, in the three voyages of discovery which he made in the years 1768-71, 1772-5, and 1776-9.

James Cook, who is certainly to be considered as one of the great openers-up of the world, was the son of an English farm-labourer. When he was sixteen years old he was apprenticed to a grocer in a sea-coast village. He wished to be a sailor, however, and managed to be made an apprentice on a collier ship. In due course he became an able seaman, and then, at the age of twenty-four, he was promoted to be mate. All this time he had been studying hard in his spare time to learn navigation, and to educate himself. After three years Cook enlisted in the Navy as an able seaman, but was soon raised to be master's mate. He took part in the naval operations during the conquest of Canada, and made some careful surveys of the St. Lawrence and the coasts of Newfoundland.

In 1768 he was put in command of H.M.S. *Endeavour*, sent out by the Admiralty, at the instance of the Royal

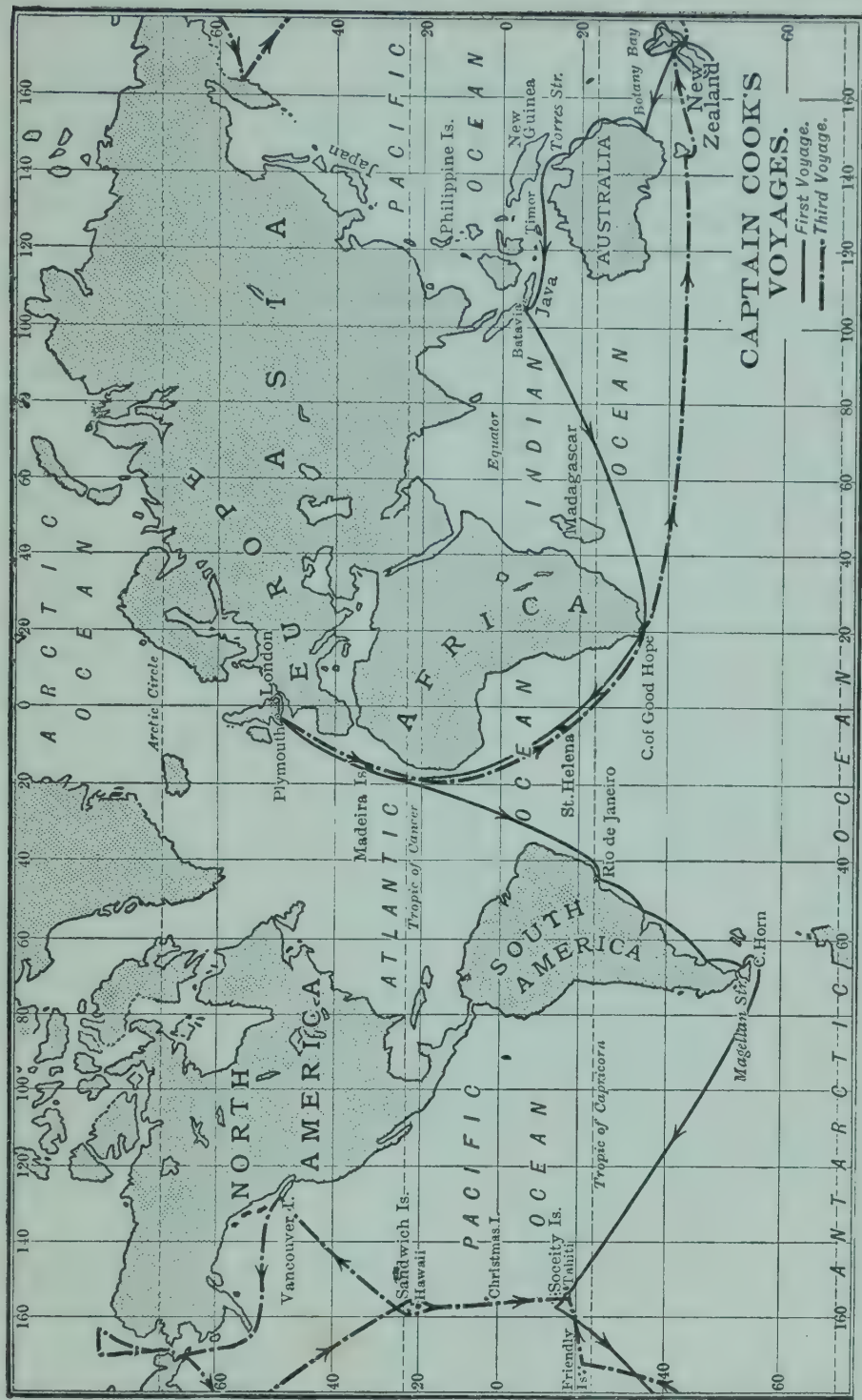
Society, to observe from Tahiti the transit of Venus. At the same time Cook was told to search for the supposed southern continent, which it was thought might extend from the tropic of Capricorn to the South Pole.

Along with Cook there went one of the most scientific men of his day, Sir Joseph Banks, whose name ought always to be associated with that of Cook in the history of this voyage. He was a man of wealth, devoted to scientific research, more especially to botany, and he joined this expedition entirely at his own expense, furnishing all the needed instruments. To his journal, incorporated with that of Cook in the published record of the voyage, we owe the valuable descriptions of plants, animals, and men which make that record of permanent value to science.

XLVII.—COOK'S FIRST VOYAGE

Captain Cook sailed from Plymouth on 26th August, 1768, in H.M.S. *Endeavour*, with a crew of ninety-four persons in all, including Sir Joseph Banks with his assistants and servants. Captain Cook and Sir Joseph Banks were determined to fight against scurvy, the disease which was such a terrible foe in those days to sailors on long voyages. For this purpose, among other vegetable preparations casks of concentrated lemon and orange juice were shipped; and these juices proved very effective as preventives. Thus to Cook and Banks may be rightly attributed the discovery of the good effects of the use of lime-juice, a use which has practically abolished scurvy, formerly the most dreaded scourge at sea.

Having sailed across the Atlantic to the coast of



Brazil, Cook went southwards and rounded Cape Horn in January, 1769; then he proceeded as far as the 60th degree of S. latitude without sighting land. The course was then changed north-westwards into the Pacific, and the first land sighted, in April, was one of those coral islands, called atolls. The seamen revelled in the fruit of the coco-nut groves of this island. Continuing his course Cook reached Tahiti on 12th April, 1769. He gave the name of Society Islands to this group.

Here a stay of some months was made; and, in spite of some misunderstandings at first, excellent relations were established between the voyagers and the natives of Tahiti and the neighbouring islands. Cook gives most interesting accounts of the natives and of their manner of life; he was particularly struck with their handsome, clean appearance. The people of Tahiti, like the rest of the Polynesians in Cook's day, had all their tools and weapons made from stone or shells or bone. Yet with their stone axes they were able to fell, and split into planks, trees 8 feet thick and 40 feet long. They also constructed large canoes, some of them 60 feet in length. Cook took one of these pleasant, friendly Tahitians along with him as an interpreter when he left the island.

Sailing south-west from Tahiti, Cook anchored off the east coast of the North Island of New Zealand on 8th October, 1769. He and his party were the first Europeans probably who had ever landed there. The Maoris, as the natives of New Zealand are called, a strong and brave race, at first resisted the landing of the strangers, but Cook's friendliness and patience soon won them over, so that they were quite willing to trade, and to admit the Englishmen even into their villages and houses.

One thing much disgusted Cook's party: that was the practice of cannibalism among the Maoris.

On 30th January, 1770, Cook hoisted the British flag on the shore, and formally took possession of the two great islands of New Zealand in the name of King George III. He then proceeded to sail round the islands, making many observations whenever he landed, not only with regard to the people and their way of life, but also as to the natural products of the country.

Cook finally set sail from New Zealand on 31st March, 1770, and on 19th April sighted the south-eastern coast of Australia, and anchored on 28th April in Botany Bay, as he called the place on account of the abundance of strange plants noticed there. There they saw some natives, but were unable to induce them to make friends.

On the voyage northward along the coast of what was afterwards called Queensland, the *Endeavour* ran on a coral reef, and very nearly became a total wreck. It was found possible, however, to patch up the leaks, and to continue the voyage. When he reached Cape York, and realized that he had found the passage between Australia and New Guinea, Cook landed and formally took possession of the great island continent in the name of his king, George III, giving the name of New South Wales to the eastern coast which he had explored.

Proceeding on his voyage, Cook reached the Dutch settlement of Batavia, in Java, where an epidemic disease attacked almost every member of the expedition, and caused the death of several of them, among these being the interpreter whom they had brought from Tahiti, and his son.

From Java they sailed to the Cape of Good Hope, and then back to England, which they reached on 12th June,

1771, after a voyage in which a new empire for the English race was opened up in the southern hemisphere.

XLVIII.—COOK'S SECOND AND THIRD VOYAGES

Shortly after his return the English Admiralty placed Cook in command of the ship *Resolution*, which, with a smaller vessel, the *Adventure*, under the command of Lieutenant Furneaux, was equipped and sent out to complete the exploration of the southern hemisphere. This expedition, among other objects, was to try and reach the South Pole. It left England at the end of July, 1772, and, after touching at the Cape of Good Hope, proceeded as far south as the 64th degree, but sighted no land. During the voyage the ships were separated; but a meeting place in New Zealand had been previously agreed upon in case of such an event.

The *Resolution* reached New Zealand in March, and was joined not long after by the *Adventure*. This ship had been blown out of her course, and had made the south coast of Tasmania, where the crew had landed. After exploring that coast Lieutenant Furneaux had sailed for New Zealand, as had been agreed on.

From New Zealand the ships sailed to Tahiti. It is a striking instance of the trust which the native people there placed in Captain Cook, that they not only accepted his explanation as to the death of their friend whom he had taken away with him on his first voyage, but that another of them willingly consented to go with him on this second one.

From Tahiti Cook returned to New Zealand, discover-

ing on the way the Tonga Archipelago, which he named Friendly Islands. Having again lost sight of the *Adventure*, and being unwilling to lose time waiting for her, Cook sailed southward in the *Resolution* as far as latitude 72° , where, surrounded by ice-fields and vast ice-precipices, he thought he discovered an utterly uninhabitable land. Then sailing north again, he touched at Easter Island with its mysterious stone statues and buildings, the remains of a forgotten civilization. Continuing his voyage he touched at the Marquesas, and discovered several other islands, though it is strange that he missed Fiji, and reached the New Hebrides. Sailing from there he discovered the island called by him New Caledonia. Between New Caledonia and New Zealand he discovered Norfolk Island.

Not having received any news of the *Adventure* in New Zealand, he sailed across the Southern Pacific, and, after visiting the Falkland Islands, sailed across the Southern Atlantic to the Cape of Good Hope, whence he made his way back to England, where the *Adventure* also soon arrived, after a voyage lasting more than three years, during which only one man had been lost from sickness.

A year after his return Cook was once more appointed to command the *Resolution*, for further exploration of the Pacific, and to examine the western coast of North America, to find out whether there was a passage possible for ships from the Pacific to the Atlantic. A smaller ship, the *Discovery*, was commissioned to go as consort to the *Resolution*.

In the summer of 1776 the *Resolution* and *Discovery* made their way into the Indian Ocean, after the usual stay at the Cape of Good Hope. Christmas Day that

year was spent on the desolate, wind-swept island of Kerguelen, where a fresh supply of water was obtained. From there they sailed for New Zealand, first landing on Tasmania, where they noticed that the natives were of a different race to those of the neighbouring Australian coast.

After a visit to New Zealand, and a long stay in the Tonga Archipelago and in Tahiti, Cook directed his course northward, and after discovering Christmas Island, sighted the Hawaiian group, to which he gave the name Sandwich Islands, from the name of the then First Lord of the Admiralty. He stayed for a time among these beautiful islands, with their wonderful volcanoes, and then went on to explore the little-known north-western coasts of North America. Returning southwards he again landed on Hawaii, where he was killed, on 14th February, 1779, by the natives in a skirmish which had arisen largely from a misunderstanding.

Cook was one of the greatest of British navigators. He not only made almost all the remarkable discoveries of the Pacific Ocean between the ice fringe to the south and Behring Strait to the north; but he did this with singularly little loss of life to his men, of whose health he was most careful. In his dealings with native races he was always patient and kind. It is worth remembering that this great Englishman rose, by force of character, from being an apprentice on board a collier to command vessels in the Royal Navy, and to perform voyages more wonderful in some ways than that of Columbus. These voyages made known to the world the coasts of the Arctic and Antarctic Oceans, the continent of Australia, the Dominion of New Zealand, and most of the groups of islands of the Pacific Ocean.

XLIX.—EXPLORATION OF AFRICAN RIVERS

In our days, when it is possible to travel by railroad from Vladivostock to Lisbon, or from Vancouver to Halifax, with comfort and rapidity, it may easily be forgotten how very toilsome and tedious journeys overland really were, before the coming of the locomotive and the motor-car. More especially is this the case in the tropics, where the heat of the sun renders long marches almost impossible, and where paths have often to be cut step by step through thick forests of giant trees and the tangled mass of undergrowth between their trunks.

It is for this reason that the interiors of the great continents of Africa and South America are still not completely mapped out. In fact it has only been possible within the last few years to draw a fairly accurate map of the interior of Africa.

Tropical Africa is divided from the countries on the coast of the Mediterranean by the largest expanse of desert in the world, the Sahara. It was across this desert, by means of caravans, that the gold, ivory, ebony, and ostrich feathers of equatorial Africa were obtained by the Egyptians and Carthaginians, and later on by the Romans, who had mastered all the countries round the Mediterranean. Even after Roman rule had been replaced on the north coast of Africa by the victorious Mohammedans, the same trade across the Sahara went on, as in fact it still does to some extent.

The successful exploration of the African coast after the 15th century soon led to efforts on the part of European nations to explore the interior from the coast.

Very naturally the large African rivers attracted the attention of adventurous traders, because in most cases

they could sail up them for some distance. The Portuguese, and later on the British, began to enter the mouths of the Gambia, the Senegal, and the Congo on the West Coast, and the Zambesi on the East, and to form trading stations on these rivers.

These trading stations soon became slave-markets, where thousands of Africans, captured in the interior, were sold, and then shipped across the Atlantic to supply labour to the newly-formed plantations of European nations in tropical America.

Towards the end of the 18th century, however, the people of Great Britain began to see that this horrible slave-trade must cease. Some of them saw that trade with the interior of tropical Africa in other things besides human beings might be profitably encouraged. The African Association was the name of a British company which in 1793 sent out a young Scottish doctor, Mungo Park, to explore the interior countries of Africa lying to the south of the Sahara, and, if possible, to enter into trading relations with the people.

He proceeded to an English trading station which was situated some distance up the Gambia, and thence through an utterly unknown country to the north-east. The story of his wanderings among many different nations, the hardships he endured, the dangers which he surmounted, and the discoveries he made, was told in a remarkable book which he published after his return to England in 1797.

He was the first European to embark on the upper course of the great Niger, and to visit the shores of Lake Chad. He thought that the Niger was connected with Lake Chad, and that it was the upper basin of the still greater river, the Congo. To settle this question,

in 1805 he undertook a second journey in the same region. On this occasion, when he seemed to be within reach of his object, and had actually set sail on the Niger in its southward course, the canoe was upset in some rapids, and Park, together with the survivors of the expedition, was drowned. This happened less than a year after he had set out.

The problem of the Niger's outlet was not settled until the middle of 1831, when the brothers Richard and John Lander returned to England from a journey they had started on in January, 1830. They had landed near Lagos, and had gone north through the Yoruba and Borgu countries until they had reached the Niger. Thence they descended the river in canoes, passing through many perils, until they reached the Atlantic, and the trading port of Brass on one of the Niger arms. They brought back the certain knowledge that there were no insuperable difficulties in the way of vessels entering the Niger from the sea, and penetrating far into some of the most fertile and productive parts of tropical Africa. This led to a great trade between Britain and those regions.

L.—EXPLORATION OF AFRICAN RIVERS

(Continued)

It was only in the last quarter of the 19th century that anything definite was known about vast regions in the interior of Equatorial Africa, peopled with races of very varying degrees of civilization, from the intelligent inhabitants of Uganda to the pygmies dwelling in complete savagery in the depths of the Congo forests.

The problem of the sources of the Nile has always had a peculiar attraction for Europeans from the time of the Greek traveller Herodotus. It was reserved for British explorers of the 19th century to demonstrate the substantial accuracy of his account that the Nile had its source in vast lakes, surrounded by snow-clad mountains, some distance south of the Equator.

Two English explorers, Burton and Speke, starting from the east coast of Africa, discovered the great Lake Tanganyika in 1858. Speke on the same occasion penetrated farther north, and reached the shores of the largest of the African lakes, now known as the Victoria Nyanza. He shrewdly suspected that he had hit on the principal source of the Nile, but he and his companion Burton had to return to England without being able to verify the surmise. Returning to Africa in 1863, Speke, along with another explorer, Grant, proved that this idea was correct, for they descended the Nile and traced its course from where it left the Victoria Nyanza to its well-known lower portion in Egypt.

Meanwhile the opening up of the interior of Africa had been greatly contributed to by the explorations of one of the greatest and kindest explorers who ever lived, David Livingstone. He first went to South Africa as a missionary to the natives when he was twenty-eight years old, in 1841. During his missionary journeys northwards he crossed the Kalahari Desert, and penetrated the then completely unknown country to the north of that, as far as the great River Zambesi. The lower portion of this river had been known for centuries to the Portuguese, who had established a colony at its mouth, but its upper portion had never been visited by a European before Livingstone. On this occasion he

explored a considerable length of the river, discovering and naming the famous Victoria Falls, in some respects the most imposing cataract in the world. He returned to England in 1856, where his discoveries made him immediately famous.

In 1858 he returned to Africa to explore the upper portion of the Zambesi and the countries through which it flows, with a view to establishing trade relations with the people, and of civilizing them. He started from the mouth of the Zambesi, and explored a large part of its course, turning into its large tributary the Shiré, which he traced to its source in another large lake, Nyasa. All the country around he found laid waste by the raids of the Arab slave-traders from the east coast.

Full of indignation he returned to England in 1863; and thenceforward he devoted his life to exposing the horrors of the slave-trade, and to making European nations determine to suppress it. With this object he returned to Africa in 1866, and spent the remainder of his life in the countries round Lakes Nyasa and Tanganyika. When he had not been heard of for some years it was feared he was dead, so an expedition was sent out in 1872, under Henry M. Stanley, to find out what had become of him. Stanley found him sick, and with all his supplies exhausted, at Ujiji, on the north shore of Lake Tanganyika. He would not return with Stanley; but he never regained his health. The next year his dead body, together with all his papers, was brought to the coast by some faithful servants, with the story of how he had succumbed to disease in Ujiji. His body was taken to England, and laid in Westminster Abbey, where so many other famous men are buried.

To Stanley belongs the honour of tracing the Congo from its sources to its mouth. Acting upon Livingstone's hints, Stanley returned to Africa in 1874, and started from Zanzibar back to the neighbourhood where he had met Livingstone. Until 1877 he and his followers remained unheard of, and then he reappeared at the Portuguese settlements near the mouth of the Congo. He had crossed Africa from east to west through the dense forests which cover most of the basin of the Congo, and had shown that that river, which no European had ascended before for any great distance, afforded a magnificent waterway into the heart of tropical Africa.

To Livingstone and Stanley chiefly is due the knowledge gained by European nations in late years of the interior of southern tropical Africa, which has led to the interest now being taken by them in its development.

LI.—EXPLORATION OF SOUTH AMERICAN RIVERS

The mightiest river in the world is the Amazon, which has a course of 4000 miles, and, with its tributaries, drains the largest portion of tropical South America. This enormous river flows into the Atlantic in a delta, the largest stream of which is 50 miles broad at its mouth. So great is the volume of fresh water poured out by the Amazon that its influence is felt 200 miles out to sea, while the influence of the ocean tides is felt 400 miles up the river. The conflict between the river current and the ocean tide periodically causes the rush of tremendous waves up the lower part of the river.

These periodic waves are called "bores" in English, and are often destructive to shipping in the river, sometimes also causing serious floods in the low-lying lands on the river's banks. It is said that the name Amazon has no connection with the legendary women warriors, but is really derived from a native word of similar sound, which means "boat-breaker", in reference to these destructive bores.

The mouth of the Amazon was entered by a Portuguese sailor in the year 1500, and since then it has been navigated for thousands of miles by succeeding explorers. The largest ships can make their way for hundreds of miles up the river. In fact, it is navigable from its mouth in the Atlantic, across the breadth of South America, to within comparatively a short distance from the Pacific. In spite, however, of this river being an incomparable waterway into the heart of tropical America, the countries through which the Amazon and its tributaries flow are still to a large extent only slightly explored. Vast regions of this part of the world consist of unpenetrated forest. The collection of rubber in recent years from rubber trees in these forests has been a growing industry, attended unfortunately with some bad results, such as the ruthless cutting down of the rubber trees; and, worst of all, the subjecting of the defenceless natives in some places to a kind of slavery very thinly disguised, but none the less inhuman.

Another river which forms a natural waterway into the northern portion of South America is the Orinoco. This river is associated with the exploits of the famous Englishman Sir Walter Raleigh, who penetrated the tropical forests of South America for a long way, by following its course from its mouth. He was led to do

this by the legends told in his days of the wonderful city of Manoa, which was supposed to lie in the heart of South America. This city, it was said, had become the refuge of the Peruvians driven from the Pacific side of the continent by the Spaniards. Here they were reported to have preserved their ancient civilization; and the story ran that they roofed their buildings and clothed their rulers with pure gold. To reach this golden city and its king, "El Dorado" — the golden one—as the Spaniards called him, was the dream not only of Raleigh, but of many another adventurous spirit in the 16th and 17th centuries. Manoa and El Dorado have been proved to be only creations of the fancy; but the opening of gold-mines in the interior of Venezuela and Guiana in recent years has shown that there was some truth in the story of gold on the Orinoco.

The other great river of tropical South America is known best as the La Plata, although that name really belongs to the large estuary formed by the junction of several large rivers, the Parana, with its tributary the Paraguay, being the largest.

The great river system formed by the streams uniting in the La Plata has been utilized better than most other such systems in the continental tropics for opening up and developing the resources of the interior. Centuries ago the Spaniards built towns and cities far up the Parana and the Paraguay; and the Argentine Republic, through which these rivers run for the greater part of their course, is to-day probably the most developed in its interior of any of the republics, into which the old Spanish-American tropical dominions have been divided. Much, however, of the region around the upper sources of these rivers still remains almost unknown.

LII.—INTER-OCEAN CANALS

We have tried to show how it has come to pass that it is easy nowadays to travel all over the world, and how the products of one part of the world, especially of the tropics, are obtainable without difficulty in other parts, because they can be so easily carried over the sea in ships.

The ocean road, however, from east to west is naturally barred by the two great earth masses—the eastern consisting of Europe, Asia, and Africa, and the western of North and South America. Until 1869 no ship could pass eastwards from the Atlantic into the Indian Ocean, except by sailing round the southern point of Africa; until 1913 no ship could pass westwards from the Atlantic into the Pacific Ocean, except by the still more stormy voyage round the southern end of South America, or by the almost impossible one through the intricate passages of the frozen seas around the North Pole.

Yet the vast masses of the eastern continent are nearly broken through where the Red Sea runs up from the south, almost within view of the Mediterranean, with only the narrow, flat Isthmus of Suez to separate them. This fact caused the countries in the neighbourhood of this isthmus to become, and to remain for many centuries, the centres of commerce of the world.

From the time of the Pharaohs, attempts were made to connect the Red Sea with the Nile, and so with the Mediterranean, by a canal. This was actually done, it is said, by the great king Sesostris, as the Greeks called him. Successive conquests of Egypt, and the neglect of public works arising therefrom, caused this canal to become ruinous, though a part of it still exists.

In the middle of the 19th century the French engineer,

Ferdinand de Lesseps, undertook to construct a canal capable of conveying the largest ships from Port Said on the Mediterranean to Suez on the Red Sea. Under the authority of the Khedive of Egypt, and with the support of the French nation in money and influence, De Lesseps accomplished the enormous task of building a canal nearly 100 miles long, broad and deep enough to float the largest ships, through the Isthmus of Suez. It took ten years to do the work; the canal being opened in 1869. Thus the science of the 19th century carried on the work of the courage of the 15th, by making a new ocean road to the East and to Australia.

The great earth barrier between the Atlantic and the Pacific is also narrowed down to a very short distance in the Isthmus of Panama. This, however, is mountainous and rocky instead of being flat and sandy. De Lesseps, after his successful construction of the Suez Canal, began plans for cutting through the western isthmus from Colon on the Atlantic to Panama on the Pacific. Millions of pounds were subscribed, chiefly in France, for the carrying out of this plan, and the work was begun in 1880. The enterprise failed, though much good work was done. Reckless waste of money and material contributed largely to this failure, but disease—yellow fever and malaria—which killed the workmen by thousands in the swamps of the isthmus, was probably the chief cause of failure.

It was so evident that a canal through the Isthmus of Panama would be of great benefit to the commerce of the world that the idea did not die. In 1904 the people of the United States took over the task. First, they fought the mosquitoes, which had been found to be the cause of the deadly yellow fever and malaria, so that they



Constructing one of the great Locks, Panama Canal

made the isthmus quite a healthy place for the workers. They maintained an army of men at work, largely composed of natives of the tropics, labourers from the West Indies. In 1913 the gigantic task was completed, and ships passed over the hills of the Isthmus of Panama from the one ocean to the other. This has been accomplished by the construction of a system of locks, or steps of water so to speak, in which a ship is raised or lowered from one level to another. In the length of the canal of about 50 miles there are six of these locks.

This wonderful bit of engineering, with which the 20th century has opened, must have a great effect on trade routes. In the past the changes of trade routes have had far-reaching effects on the nations of the world. What effect the Panama Canal will have is hard to foresee. One thing, however, is certain, that it will make communication between east and west, north and south, easier and speedier than ever before. In fact, by dividing the land at Suez and Panama, the present generation have contributed their share to uniting the world.

LIII.—OCEAN TRAVEL AND TRANSPORT

The trade in perishable products like oranges and bananas has grown, as will have been gathered, into large proportions. This is due to the ability to transport them rapidly from place to place in large steamships fitted with special appliances for maintaining a cool atmosphere about the fruit. This helps us to understand the wonderful advance that has been made in shipbuilding, and the means of sea transport in the last 400 years.

The brave Portuguese and Spanish explorers, who in the 15th century showed the world that the ocean was the highway on which the commerce of the nations could best be carried, made their explorations in such small vessels that men of to-day cannot but admire the courage that dared to face the terrors of unknown oceans in such frail craft. Their rivals, the Dutch and English sailors of the 15th century, were hardly better off as regards their ships, though the way had been shown them. Here is a translation of what the Latin poet, Horace, says: "The man who first attempted to cross the stormy sea must have had his heart armed with triple bronze".

The use of some sort of craft to make a kind of a voyage in, whether along the coast, or across a river, must have been one of man's earliest inventions. A floating log perhaps was the first means employed; and then a raft of two or more logs lashed together; and then the hollowed log pointed at one or both ends, the dug-out canoe, were utilized for the purpose. But logs are heavy, and the labour of hollowing them and shaping them by stone tools, even with the aid of fire, must have been long and arduous labour. We can imagine some prehistoric man, seeing a large bit of the bark of a tree floating down a stream, seizing the idea of fastening the ends together, and strengthening the boat thus produced with ribs of tree branches, and we have the essential idea of all the ships of succeeding ages. The birch-bark canoe, with its ribs of wood bent to shape and tied inside it, is the parent of the monster steel ship of the 19th century with its shell of steel plates riveted to the huge framework of steel ribs and cross-beams.

More than 3000 years ago we know that the Egyptians

and Phœnicians built ships, to propel which they not only relied on oars wielded by human arms, but employed large sails, by means of which they compelled the wind to their service. So, as the ages progressed, ships were improved more and more, till at the beginning of the 19th century ocean-going ships, built of wood, were of great size, capable of carrying large cargoes, and troops of men, but still dependent on the wind for motive power, which they utilized by means of lofty masts to which were attached clouds of canvas sails. The great three-masted clippers which sailed round the Cape of Good Hope to bring tea from China were, when seen under a full pressure of sail, probably the most artistically beautiful ships man has ever put on the ocean.

But by the end of the century these beautiful sailing-ships had almost disappeared. The invention of the steam-engine in the last half of the 18th century, and its application to the propulsion of ships, made a great change in ideas of ocean travel. When also it was shown in the middle of the 19th century that ships could be constructed of iron and steel, which were relatively lighter, more capacious, and stronger than those built of wood, such wooden ships were naturally less and less built.

So we come to the age of the iron steamship. Almost all of the world's travel and traffic on the water is now carried on in vessels built of iron and steel, driven on their way by steam-engines regardless of wind and tide. This applies to all sizes and sorts of vessels, from the small launch to huge ocean liners, built for passenger accommodation, luxurious, floating hotels, with every appliance of comfort. Some of these steamers are huge storehouses carrying thousands of tons of every sort of

commodity; some are great battleships, floating fortresses, manned by hundreds of men, and armed with giant guns; all are driven by engines which, with a force reckoned in thousands of horse-power, enable them to keep straight on their way at great speed in spite even of adverse storms. Such steamships are built and used by all the nations of the world, from the conservative Chinese to the progressive British or French.

These steamships, too, are planned wonderfully to meet the purpose for which they are wanted. Those which have been referred to as carrying bananas from Central America, or those which carry apples from New Zealand to Europe, are fitted with apparatus for cooling and circulating the air in the holds in which the fruit is carried, so that, though the voyage is through some of the hottest seas of the world, the temperature is always kept at the proper degree to allow the fruit to remain fresh and sound. Cooling appliances are also made use of in bringing shiploads of fresh meat, beef and mutton chiefly, in a frozen condition from Argentina and Australia across the torrid zone to the markets of Europe, where it arrives perfectly sweet and wholesome.

The grain ships and the oil ships which are used for the purpose of transporting these articles from places where they are produced to the markets where they are needed, are so constructed as to be, in the one case, huge bins containing thousands of tons of wheat, and in the other, huge tanks of oil. The oil and the wheat are carried without being put in separate packages, such as bags or barrels, and thus the cost of transport is reduced.

Not only have steam and iron made the commerce of the world vastly greater than it was, but the travel of the world is very different to-day from what it was a

hundred years ago. The voyage which then would have taken weeks or months, and would only have been undertaken with serious resolve, is now an affair of as many days. It is easier to go to-day from one end of the world to the other, than it was a hundred years ago to cross the Atlantic.

The facility and rapidity with which voyages may be made nowadays are remarkable enough, but not less so is their comparative safety. The mighty power of a big steamship's engines enables it to withstand the force of most storms with success, and the policing of the ocean's routes by the ships of war of Great Britain and other civilized sea powers, makes the piracy and buccaneering of bygone days, which formed a very real peril of the deep, too risky a trade to follow. The big ships go in safety up and down the world across its oceans, and so spread mutual knowledge among the nations, and allow the products of each to be spread among them all to their general advantage.

LIV.—HEALTH IN THE TROPICS

Nowadays travellers by sea need hardly fear storm or disease while being carried to any part of the world they have a mind to visit; but the navigators who first discovered and settled in new countries, especially in the tropics, had to face very heavy risks and meet utterly new conditions of life. The climate was one to which Europeans were unaccustomed; the food was largely different; and, apart from human enemies, all sorts of animal foes had to be faced; the very deadliest of them not being

recognized as particular enemies until quite recently. It is hardly to be wondered at that these early travellers and settlers, although they were amazed and delighted with the wonders of the new tropical lands opened to their knowledge, considered them very dangerous places to live in, while those who remained in Europe thought that their friends who were going to settle in the tropics were going to an early death.

The history of early settlements of Europeans in hot damp climates shows that this feeling was not unfounded. The settlers in many places did often die in numbers from dysentery and fevers, brought on by improper feeding, or neglect of the ordinary laws of health, or from not understanding the causes of the diseases which attacked them, and therefore taking no precautions against infection.

As the safety in reaching these countries to-day as compared with even a hundred years ago has grown, so has the safety in dwelling in them. The idea of the unhealthiness of the tropics is hard to remove from the minds of people of colder countries; but it is a fact that to-day Europeans may safely live in almost any place in the torrid zone, and keep in good health, if they will only gain a little knowledge of the way in which they must regulate their lives.

In the first place, a hot climate tends to produce a feeling of lack of energy in those who come from more bracing colder climes. This feeling is very trying, and new-comers often think that they can be invigorated by heavy meals of animal food, or too frequent doses of alcoholic stimulants. This is a deadly mistake; health is more and more undermined by such courses. It is sad to think how many promising lives have been lost

in the tropics, not so much from fevers but from over-indulgence. To be really temperate both in food and drink is the foundation law of health everywhere; but it is now known that the habitual violation of this law leads inevitably in the tropics to sickness and death.

It has been mentioned that enemies of all kinds in the animal world had to be faced by the early settlers in the tropics. The larger wild beasts of prey have so fallen victims to the modern rifle that they can no longer be said to be any real source of danger to residents in tropical countries. It is true that in many places poisonous serpents are the cause of many deaths, but care and watchfulness are usually sufficient guards against this danger. The most deadly foes of the animal world to residents in the tropics belong to the insect world. This has only been proved by the researches of scientific men in the latter part of the 19th century. Hence it has only been of late years that steps have been taken to combat these plagues, which are now known to have been the cause of the majority of deaths in tropical lands.

The common house-fly is responsible, not only in the tropics, but throughout the world, for carrying the germs of many infectious diseases from one person to another. It is to be hoped that a war of extermination will be ceaselessly waged against this enemy of the human race. Strict cleanliness of houses and their surroundings, and careful protection of food from visits of flies, would do much in this direction. House-flies breed in accumulations of manure and similar matters; removal of manure heaps and of accumulations of dirt will quickly be followed by a diminution in the number of flies in any district.

Residents in the tropics have complained bitterly, from

the time of their first settlements, of the irritating mosquito. Its bite, though painful, was not thought to be of much consequence. People were weakened by malarial fevers, and at length succumbed to their attacks; or were swept off in hundreds by epidemics of yellow fever, the dread especially of European soldiers and sailors; but no one thought of connecting these fevers with the mosquito until recently. The fevers were supposed to be caused by poisonous air from swampy districts or marshes, hence the name "malaria", which means in Italian "bad air".

Now, however, it has been proved by scientific men that these fevers are caused by microscopic organisms which are carried by mosquitoes from one person to another; and that, as far as is known at present, this is the only way in which infection can be spread. It has been mentioned in a former lesson how it was discovered that quinine was the great remedy in malarial fevers, probably because it kills the malarial parasites in the blood; but the discovery of the cause of the fevers, and how the infection is carried about, has done still more than the discovery of quinine to make residence in the tropics safe, because it has shown how to escape the disease entirely.

The war against mosquitoes, which is being carried on in most parts of the tropics, has made places safe to live in nowadays in which it was very risky for a European to stay for any time not long ago. The Americans may justly be proud of the health they have brought in this way to places like Havana and the Isthmus of Panama; and the British are doing similar work in their West Indian and West African colonies. The draining of stagnant pools, where mosquitoes breed, or covering the water with a film of oil, and the use of wire-gauze

blinds to windows and doors, are the chief methods in fighting the mosquito peril.

There are many different kinds of mosquitoes, and it has been proved by the scientific men, who have investigated the question, that every disease spread among people by them requires its own special species as carrier. Thus one species carries about the microbes which cause yellow fever, and a quite different species those which cause malaria, while some species are, as far as is known at present, quite harmless.

Other insects are known to be the carriers of other tropic diseases. The "hook-worm", which has been carried from West Africa to the West Indies and the American continent, is the cause of a wasting and often fatal disease. The flea is the carrier of the terrible "plague" which has caused immense loss of life in India, and has been carried to many other lands. The "tse-tse fly", whose bite is fatal to horses in parts of Africa, is believed to carry the germs of the "sleeping sickness". That most hopeless of diseases, leprosy, is thought to be spread by flies, or perhaps by the bite of the disgusting bed-bug. The causes of these diseases being known, their occurrence is being surely lessened. The great points are strict attention to the laws of health; cleanliness in person and in dwelling; temperance in food and drink; and destruction of these insect pests in all possible ways.

NOTES

Lesson

1. in the East, in India, Further India, or the Malay Archipelago, or in China or Japan.

Africa, the south-western of the three divisions into which it is usual to break up the great land mass called the Old World. The greater part of Africa is tropical. It includes the countries between the Barbary States and South Africa.

West Indies, the name for the islands between North and South America lying between the Atlantic Ocean and the Caribbean Sea and between the latter and the Gulf of Mexico.

tropical lands, lands lying between $23\frac{1}{2}$ degrees north and $23\frac{1}{2}$ degrees south of the Equator.

remote, inland and not easily reached parts, parts far away from the coastal settlements.

colonies or protectorates. A colony is a country mainly occupied by people from the colonizing land; a protectorate is a portion of country under the guardianship of another country which holds itself responsible for the foreign relations of the country it protects.

2. estimated, reckoned or calculated.

imported, brought from the country of its origin into another country.

Black Sea, the sea between Southern Russia and Asia Minor.

Syria, the part of Western Asia between Asia Minor and Egypt.

Venice, a famous seaport on over a hundred small islands in a bay in the north-west of the Adriatic.

Genoa, a famous Italian seaport on the Gulf of Genoa in the north-west of Italy.

monopoly, an exclusive right or power to trade in a commodity.

Crusades, the wars carried on by the Christians of Western

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Europe against the Mohammedan conquerors of the Holy Land to recover the holy places.

Canary Islands, a group of islands in the Atlantic Ocean north-west of Africa. They belong to Spain, and their name means literally "dog islands".

mutiny, a rising of soldiers or sailors against their commanders.

Cuba, the largest island in the West Indies, forms a republic under the protection of the United States of America.

Barcelona, a very important commercial town and seaport in the north-west of Spain, was very famous in the Middle Ages.

New World, a name given to the newly discovered lands in the west by the explorers.

Vasco da Gama, Portuguese navigator (1469-1524). He was the first to make the voyage round the Cape of Good Hope to India.

Cabral, Pedro Alvares (1460-1526), Portuguese navigator, discovered the coasts of Brazil in 1500.

Azores, a group of islands in the Atlantic 800 miles west of Portugal, to which they belong.

3. **Queen Elizabeth**, Queen of England and Ireland from 1558 to 1603, was born at Greenwich, near London, 1533, died at Richmond, 1603.

King James I. On the death of Queen Elizabeth, James VI of Scotland became in 1603 James I of England and Ireland. He was born in Edinburgh in 1566 and died at Theobalds, in Hertfordshire, in 1625.

armed escort, a body of armed men whose business it is to see that the persons or goods under their care arrive safely at their destination.

Odin, the chief of the Asa-gods, the father of Thor and Balder and of several other gods, was regarded as the source of wisdom and the encourager of scholars and heroes. He is attended by two ravens and two wolves, and is regarded as the All-Father.

Turkey in Asia, now the chief part of the Turkish Empire, included before the great war Asia Minor, Armenia, and Kurdistan, Mesopotamia, Syria, and Arabia.

4. **Marco Polo**, a famous Venetian traveller (1254-1324). His father was Nicolo and his uncle Maffeo Polo. Marco was taken prisoner by the Genoese in the battle of Curzola; and in Genoa dictated the account of his travels to a Pisan, a fellow-captive.

Lesson

- Mongol**, one of the race whose original home was Mongolia, or North-Eastern Asia.
- Kublai Khan** (1216 to 1294) was the most powerful monarch of his time.
- Dnieper**, next to the Volga and the Danube the largest river in Europe. It rises to the west of Moscow, flows generally south, and falls into the Black Sea.
- Gregory X**, Pope from 1271 to 1276.
- Dominican friars**, friar monks of the order founded by St. Dominic, who was born in Spain in 1170 and died in Italy, 1221. The Dominicans were specially associated with the Inquisition.
- Acre**, a seaport on the east of the Mediterranean, on the Syrian coast.
- Oxus**, or *Amu Daria*, the chief river of Central Asia, rises in the Pamir and falls into the Sea of Aral.
- Kashgar**, the capital of Eastern Turkestan.
- Yarkand** and **Khotan**, towns south-east of Kashgar.
- Sumatra**, the large island to the south-west of the Malay peninsula.
- Tibet**, tableland to the north of the Himalayas.
- Great Archipelago**, the East Indian Archipelago, which includes such vast islands as Borneo, Sumatra, Java, &c.
- Madagascar**, the large island in the Indian Ocean to the east of Portuguese East Africa.
- Abyssinia**, a country of Africa lying to the east of the Anglo-Egyptian Sudan and to the north of British East Africa. Early in the 4th century the country was Christianized, and in the Middle Ages was thought of as the kingdom of the mythical Prester John.
5. **Tyre**, the great ancient city of the Phœnicians on the east coast of the Mediterranean.
- Cadiz**, a seaport in the south of Spain, called Kadesh by the Phœnicians, and Gades by the Romans.
- Carthaginians**, citizens of Carthage, a great commercial town of Northern Africa said to have been founded by the Phœnicians.
- Tarshish**, commonly supposed to correspond to a district in the south of Spain.
- Ophir**, from which gold and silver and precious stones, ivory and sandalwood, &c., were brought, has been thought to correspond to parts of India, Ceylon, Sumatra, Persian Gulf, &c.

Lesson

6. **Malabar coast**, a name applied to the south-western coast of India bordering on the Arabian Sea.

Henry the Navigator was born at Oporto in 1394. His mother was Philippa, the daughter of John of Gaunt, and his father John I of Portugal, the illegitimate son of Pedro I.

John of Gaunt, the fourth son of the English king, Edward III. Through his first wife Blanche he became Duke of Lancaster; hence Shakespeare's description of him as "time-honoured Lancaster".

Gambia, a river of northern tropical Africa, flowing into the Atlantic.

Bartolomeo Diaz (born about 1445, died, 1500), a gentleman of the royal household. He was the first to sail round the Cape of Good Hope. He took part in da Gama's voyage eleven years later, and in that of Cabral in 1500.

Calicut and Cochin, seaports on the Malabar coast.

7. **Levant**, a term applied to the eastern part of the Mediterranean.

Turks, a Central Asian tribe which in the 13th century, under Othman, founded an empire in Asia Minor, and in the 14th, 15th, and 16th centuries made themselves supreme in Western Asia, Northern Africa, and South-Eastern Europe.

Iceland, the large island in the north Atlantic, between Europe and America.

charts, maps especially designed for the use of sailors.

Madeira, a group of islands in the Atlantic, north-west of Africa.

Viking, a name for a Scandinavian sea-rover of the Middle Ages, from Icelandic *vikingr* = pirate, *vikr* = creek.

Vinland, some part of the coast of North America reached by the Vikings, probably the coast of the State of Massachusetts or some part farther south. It was reached by Leif Ericsson, the Icelandic explorer, about the end of the 10th century.

Genoa, the great seaport on the north-west of Italy, long the rival of Venice.

Azores, another group of islands in the Atlantic, north-west of Africa.

Lisbon, the capital of Portugal.

Palos, a seaport in the south-west of Spain.

Teneriffe, one of the Canary Islands, another group in the Atlantic, north-west of Africa.

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Bahamas, the name given to the group of many islands to the north of the large island of Cuba, and south-east of the peninsula of Florida.

galleon, a large Spanish ship with lofty stem and stern.

Philippines, a group of islands in the Pacific to the south-east of Asia.

8. **Venezuela**, the country in the north of South America, south of the Caribbean Sea.

Panama, the isthmus connecting North and South America.

Nicaragua and Honduras, countries in Central America.

Amerigo Vespucci, born at Florence 1451, died 1512, an Italian navigator, in the service of Spain. By a false claim put forward by a friend of his, a German cartographer, his name was given to the land of the New World, which he was erroneously supposed to have been the first to visit.

Vasco Nuñez Balboa (1475 to 1517 or 18), a Spanish soldier, was beheaded by Pedrarius on a charge of contemplated revolt.

Ponce de Leon (1460–1521), a Spanish soldier, born in Aragon, discovered Florida.

Florida, the south-eastern peninsula of the United States.

Yucatan, the peninsula in the south-east of Mexico.

Guatemala, a country of Central America.

Hernando Cortes (1485–1547), a famous Spanish soldier, the conqueror of Mexico.

Mexico, the country in the south of North America.

the Amazon, the great river of Brazil in South America.

Rio de Janeiro, now the capital of Brazil on the east coast.

Monte Video, now the capital of Uruguay.

Rio de la Plata, the great estuary on the south-east coast of South America.

Patagonia, the southern portion of South America.

Inca, a native title of the ancient Peruvian sovereigns.

California, the peninsula to the west of Mexico.

Oregon, the north-western state of the United States.

the Orinoco, the great river of Venezuela.

the Parana, the great river of the Argentine Republic, flowing into the La'Plata, as the estuary of the Parana and Uruguay is called.

9. **Guanahani**, the first land touched by Columbus in America.

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Some identify it with San Salvador, others with Grand Turk, and others with Watlings Island.

Amazon, the largest though not the longest river in the world, drains equatorial South America.

hieroglyphic writing, writing by the use of picture symbols.

prehistoric, belonging to times before those of which written records remain.

10. **Moluccas**, a group of islands east of the Great East Indian Archipelago, which latter are called also the Malayan Archipelago from the race of people chiefly inhabiting the islands.

the Southern Sea, the name given to the Pacific Ocean by the early Spanish explorers who first sighted it lying to the south of the Isthmus of Panama.

Tierra del Fuego, "the land of fire", a name given to the large island to the south of the continent of South America.

Philippine Islands, a very important group of islands between the Chinese Sea on the west and the Pacific Ocean on the east.

Borneo, the large island in the north of the East Indian Archipelago.

Timor (pronounced *tē-mor'*), the largest and most important of the Sunda group, belongs partly to the Netherlands and partly to Portugal.

Seville, a seaport in the south-west of Spain.

11. **the Mediterranean**, the sea between Europe and Africa. On its shores arose the Egyptian, Phœnician, Greek, Carthaginian, and Roman Empires.

Magellan, *Magalhaes*, *Fernão de*, started on last voyage with five ships and 265 men. The *Victoria* returned to Europe with 18 men, being the first ship to sail round the world.

12. **primitive peoples**, people in an uncivilized condition, savages.

Kukawa (*Kuka*), a large town in Nigeria to the west of Lake Chad, was formerly the capital of Bornu; is a place of very considerable trade, with a population of over 60,000.

"Quentin Durward", an historical novel by Sir Walter Scott, dealing with the times of Louis XI of France, Charles the Bold of Burgundy, and Edward IV of England.

Ludovic Leslie, Quentin Durward's uncle, nicknamed Balafré, or Ludovic with the Scar, plays throughout an important part in the story. He is presented as an archer of the Scottish Guard of Louis XI. A bluff but extremely loyal soldier.

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- Klondyke**, a small, shallow river of the Yukon district of Canada, gives its name to a region where valuable gold-mines were discovered in 1896.
- Transvaal**, a province of South Africa with rich gold-mines.
- Queensland**, the north-eastern State of the Australian Commonwealth, is largely gold-producing, though it is more famous for its sheep-walks and cattle-runs and for its production of fruits, tobacco, sugar-cane, and indigo.
13. **India**, the great country between the Himalayas and the Indian Ocean and between the Arabian Sea and the Bay of Bengal.
- Ceylon**, a large island to the south-east of India noted for its tea and for its spices and precious stones.
- Brazil**, a great republic occupying the whole of the middle of South America between the Andes and the South Atlantic.
- Caribbean Sea**, the part of the sea north of South America between that continent and the Greater Antilles.
- Turkish conquest of Constantinople**, took place in 1452, forty years before America was discovered.
- Syria**, the name given to the part of Western Asia lying between the Levant and the River Euphrates.
- Turkestan**, the name of two regions in Central Asia—Russian Turkestan and Chinese Turkestan. The former is a huge continental drainage area to the east of the Caspian Sea, and includes the country drained into the Caspian and into the Sea of Aral and other inland lakes of Central Asia; the latter lies between the Pamir and Kuen Lun and the Thian Shan Altai ridges and includes the Tarim basin.
- Caspian**, the largest inland sea in the world, has an area about one and a half times that of the British Isles. It lies between Europe and Asia, and has Persia to the south of it.
- Venetians and Genoese**, people of Venice and Genoa, two important cities and republics of Italy in the Middle Ages.
14. **Spice Islands**. This name was given to the group of islands between the Celebes and New Guinea, because both under the Portuguese and Spaniards spices were the chief imports from them into Europe.
- Dutch**, the name of the people of the Netherlands. The Netherlands were a part of the dominions of Philip II of Spain, against whom they took up arms to defend their religious liberties, and from whose son, Philip III, after a long struggle, they won their independence.
- Penang**, one of the Straits Settlements, consists of the Island

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of Penang and a portion of the mainland of the Malay Peninsula to the east.

Grenada, one of the Windward Islands.

testa, the botanical term for the outer covering, usually hard, of a seed.

15. **order**, a group of naturally allied families of plants.

beginning of the 17th. After a successful war with Spain the independence of the United Provinces was recognized in 1609. Portugal had been included in the Spanish dominions in 1588, and during the war of independence between the Netherlands and Spain many of the Portuguese possessions were taken by the Dutch.

Zanzibar and Pemba, two small islands off the coast of Africa. They constitute a British colony.

Penang. "The cloves, mace, and nutmegs of Penang are the finest in the world" was the statement of a writer on the Straits Settlements at the beginning of Queen Victoria's reign.

16. **Scitamineæ**, an order of monocotyledonous tropical plants.

Jamaica. The island was taken from the Spaniards in 1650.

condiment, something used to give a relish to food and so stimulate appetite.

rhizomes, root-like stems running along the surface or underground.

bracts, leaves forming part of a flower cluster, and differing from ordinary leaves usually in shape, colour, and texture.

17. **Herodotus**, a Greek traveller and historian, whose book was written in the 5th century B.C.

Java, an island of the Malay Archipelago, nearly as large as England and with a population of about 30,000,000, is the chief seat of the Dutch power in the East.

expelled the Portuguese, the Dutch revolted from Spain, and as Portugal and the Portuguese settlements had been seized by Spain, they were included by the Dutch among their enemies.

pollard, to cut off the crown of a tree in order that it may produce shoots from the top of the stem which remains.

fermentation, the action of yeasts or ferments on vegetable matter.

18. **Pliny**, a Latin writer of the 1st century A.D. who was a keen naturalist.

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Alaric, the leader of the armies of Gothic tribes who swept through Germany and France, and pillaged Italy in the 5th century A.D.

Ethelred (*the counsel-less*), 968 to 1016, had a long and unsuccessful struggle with the Danes.

Malacca, the south-western part of the peninsula of Further India.

Indo-China, another name for the peninsula of Further India.

Borneo, the largest of the East India islands, lies to the north of Java and to the east of Sumatra.

19. **Atlantic**, the long, narrow ocean between the Old and the New World.

Dr. Chanca, a Spanish physician, a native of Seville, who went in 1493 with Columbus on his second voyage to the West Indies.

Sierra Leone, one of the British colonies on the west coast of Africa.

exotic, introduced from a foreign country.

20. **Aztecs**, the race whom the Spaniards found ruling over Mexico in the 15th century. They had conquered the tribes who had in earlier times inhabited the country.

Réunion, an island in the Indian Ocean, east of Madagascar.

Mauritius, an island in the Indian Ocean.

Seychelles, a group of islands in the Indian Ocean, north-east of Madagascar.

axil, the slight hollow on the upper side of a leaf-stalk, where it springs from the stem.

21. **otto of roses** (more correctly *attar*), a perfume consisting of essential oil of roses made by distilling the flowers. It is got chiefly from India, Persia, and the Balkans.

Red Sea, the northern part of the Indian Ocean separating Africa from Arabia, the northern continuation of the Gulf of Aden.

Somaliland, the peninsula in Eastern Africa between the Equator and the Gulf of Aden. It is occupied mainly by the Somalis, a Hamitic people belonging to the great white race.

Bulgaria, the part of the Eastern Balkan Peninsula between the Danube and the Archipelago.

gland, a structure in a living body, the function of which is to secrete certain special materials, e.g. the salivary glands of the mouth.

Lesson

- 22. cereals**, plants of the wheat family, corn-producing plants.
Indus, the great river of north-west India.
Assyria, between Armenia and Babylonia, was the centre of one of the most famous of ancient empires.
Euphrates, the river of ancient Assyria, on which Babylon was built, now in Turkey in Asia.
Nile, the river of Egypt.
Babylonia, one of the most famous of ancient civilized lands. It embraced the lower plain of the Euphrates and Tigris.
terminal bud, the growing tip at the end of the stem of a plant.
California and Arizona, south-western states of the American Union.
Bassorah, a port on the Euphrates, not far from where it flows into the Persian Gulf.
pollination, the application of pollen to the stigma of a flower.
- 23. Aryans**, also called Indo-Europeans; a name applied collectively to the principal races which inhabit Europe, Persia, and India, and form the chief branch of the great Caucasian or White Division of the human race.
Semites, a name applied collectively to the group of races of whom the Hebrews and the Arabs are representative.
Hamites, the peoples of Africa north of the Sudan.
dessert, fruit or sweets, &c., eaten as the last course of a meal.
Malaga, a port on the Mediterranean, 65 miles north-east of Gibraltar.
Valencia, a seaport on the east coast of Spain, was once the capital of a kingdom of the same name.
Corinth, the city in Greece, on the isthmus of the same name.
- 24. Media**, the name given in ancient times to the north-eastern part of the plateau of Iran, the part between Parthia and the Caspian.
Middle Ages, applied to the period, roughly speaking from the 5th to the 15th century A.D., as contrasted with ancient or modern times. The civilization of Rome was almost completely destroyed by the irruption into the Roman provinces during the first four centuries of the Christian era of the barbarians of Middle Europe and by attacks from migratory Tartar tribes of Asia.
hybridization, crossing one species with another so as to obtain other varieties or hybrids.

Lesson

25. **Canary Islands**, to the north-east of Africa, are supposed to be the "Fortunate" or "Happy Islands" of the Ancients.
Sanskrit, the ancient language of the Indian Aryans.
Alexander the Great (356 B.C. to 323 B.C.), the famous King of Macedon and conqueror of Central and South-Western Asia and North-Eastern Africa.
26. **Iceland**, a large island in the North Atlantic. It belongs to Denmark, is about a fourth larger than Ireland, and is mountainous and volcanic.
New Zealand, group of islands in the South Pacific south-east of Australia, nearly as large as the British Islands.
27. **Cereals**, so called from *Ceres*, the name given by the Romans to the goddess of grain, called by the Greeks Demeter, the Earth-Mother.
Argentina, the name of the republic occupying the south-east of South America between the Andes and the South Atlantic.
28. **panicle**, an irregularly branched, loosely arranged cluster of flowers.
spike, a cluster of short-stemmed flowers set close together on the stalk.
embryo, the part of the seed which develops into the plant.
29. **Hawaii**, the largest of the group of volcanic islands in the North Pacific to which the name Sandwich Islands was given by Captain Cook. They now form an island territory of the United States of America. They consist of eight inhabited and several uninhabited islands, and are usually called the Hawaiian Islands.
30. **Athens**, the most famous of ancient Greek cities, and still the capital of modern Greece.
Mesopotamia, a Greek word meaning "between the rivers", so used to designate the region between the rivers Tigris and Euphrates, where arose in early times the Babylonian and Assyrian empires.
nitrogen, the gas which constitutes the bulk of the atmosphere, and which is an essential element of plant food.
Leghorn, the English name for the seaport of Livorno, on the west coast of Italy.
32. **Caribs**, a warlike savage people of north-eastern South America, which conquered from the gentler Arawaks the islands called after them the Caribbees.

Lesson

capsules, the seed-vessels of a plant.

Virginia, an American state so called in honour of Queen Elizabeth.

Louisiana, one of the Southern States of the United States of America, was explored by De Soto in the 16th century; settled by the French, under Iberville, in the beginning of the 18th century, and named after Louis XIV.

34. **Martinique**, the most important of the French West Indian islands.

Jamaica, the largest of the British West Indian islands.

Hayti, next to Cuba the largest of the West India islands, is divided into an eastern part consisting of the Republic of Hayti and a western consisting of San Domingo.

parasitic, living on other plants or animals, applied to animals or plants that live on other organisms and draw their nourishment from them. The plant on which the parasite subsists is called the host.

fungus, a plant belonging to the same class as the mushroom.

37. **multiple-roller**, consisting of a series of several sets of rollers.
alkali, a substance which neutralizes an acid.

38. **pinnate**, used to describe a leaf which is divided into leaflets.

39. **Hispaniola**, a corruption of Española (Little Spain), the name given by Columbus to the island of Hayti, discovered in 1492.

latex, a milky fluid found in many plants, which exudes when the plant is cut and coagulates on exposure to the air.

40. **Khotan**, a district in the south of Chinese Turkestan.

Emperor Justinian (527 to 565) purchased peace from the Persians, drew up the code of laws which is named after him.

Calicut, a town on the west coast of India.

41. **mollusc**, one of the class of animals to which snails and oysters belong.

Levant, eastern part of the Mediterranean.

43. **textile**, material used for weaving cloth.

Leguminosæ, the bean-producing family of plants.

Monocotyledons, one of the two great classes of flowering plants.

44. **Jesuit**, a member of a celebrated Order of the Roman Catholic Church, founded by Ignatius Loyola in the 16th century.

Lesson

- Andes, the chain of mountains on the west of South America.
microbe, a microscopic living creature.
mosquitoes, stinging insects of the same class as gnats.
45. Vancouver, the seaport on the island of the same name on the Pacific coast of the Dominion of Canada.
Cape Horn, the cape on an island forming the extreme southern point of South America.
46. Brittany, the north-western part of France.
New Guinea, the largest island in the world, north of Australia.
St. Lawrence, the great river of Canada, flowing into the Atlantic.
Newfoundland, the large island in the Atlantic east of Canada.
Admiralty, the British Government officials who control the Navy.
Royal Society, a famous association of British scientific men, which was founded in the 17th century.
transit of Venus, an occasion when the planet Venus can be observed from the earth to cross the sun's disk, when important astronomical observations and calculations can be obtained.
tropic of Capricorn, an imaginary line running round the globe $23\frac{1}{2}$ degrees south of the Equator, just as the tropic of Cancer is a similar line $23\frac{1}{2}$ degrees north of it. Hence the zone between them is known as the tropics.
47. Sir Joseph Banks, an English naturalist specially distinguished as a botanist. He was born in London 1744, and died there in 1820. He equipped the *Endeavour*.
atolls, coral islands of no great height above the sea situated on a strip of coral nearly surrounding a central lagoon.
Polynesians, the race which inhabits most of the Pacific islands.
Maoris, the primitive inhabitants of New Zealand.
Queensland, the north-eastern part of Australia.
48. Tasmania, the large island south of Australia. The groups of islands mentioned in this lesson will be found in the Southern Pacific north and east of New Zealand.
Falkland Islands, a group of islands in the South Atlantic off the south-eastern coast of South America.
Kerguelen, an island in the south of the Indian Ocean.

Lesson

Behring Strait, the strait separating Asia from America in the north.

49. **Vladivostock**, a seaport on the Pacific on the east coast of Siberia.

Halifax, a seaport in Nova Scotia, the south-eastern peninsula of the Dominion of Canada.

Gambia, a river of Western Africa flowing west through Senegambia far into the Atlantic. It is about 500 miles long.

Mungo Park, a famous African explorer, born 1771, died 1806. He explored part of the course of the Niger.

Lake Chad, a lake or marsh in the interior of Africa, on the southern border of the Sahara.

Richard and John Lander accompanied Lieutenant Hugh Clapperton to West Africa, and after his death edited the *Journal and Records of Clapperton's Last Expedition*. Two years later they published their own *Journal of an Expedition to explore the Course and Termination of the Niger*. Richard died in 1834 and John in 1839.

Lagos, a seaport on the west coast of Africa, in Nigeria.

Yoruba and Borgu, districts of Nigeria.

50. **Uganda**, a kingdom in Central Africa, on the borders of the great lake, Victoria Nyanza.

Nyasa, Tanganyika, Victoria and Albert, the great lakes of Equatorial Africa.

Kalahari Desert, the desert country north of the South African State.

Zanzibar, an island off the east coast of Africa.

51. **Amazon**, called also the Marañon, has a length variously estimated at from 3300 to 4000 miles. It is of much larger volume than any other river in the world. Its two chief head rivers are the Marañon and the Ucayli. Of these the Ucayli is the larger.

52. **Khedive**, the title of the modern ruler of Egypt.



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